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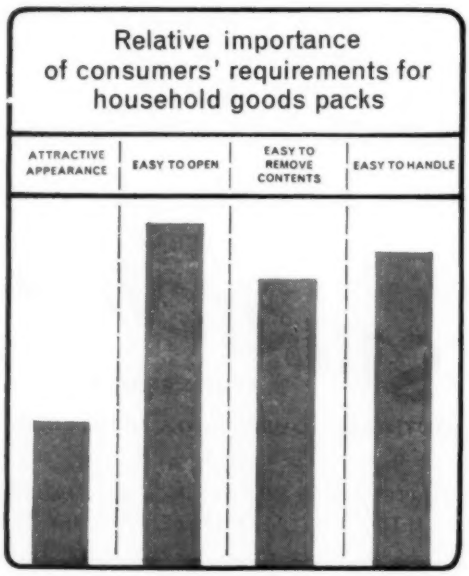

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TOPICS AND COMMENTS

Russia's green light for polio pills

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It is expected that the prospect of obtaining the Research Diploma will be particularly attractive to those who are unable to satisfy the requirements for taking a higher degree of a university but who may be able to undertake research under an approved supervisor in a technical college, an industrial firm, a government department or a research association. The scheme will apply equally to university graduates and those who qualified at technical colleges.

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Australia and a further 50 smaller establishments. Half of the leading firms are Australian, the others are subsidiaries of overseas firms, principally English and American. In addition the Federal Government engages in the industry through the Commonwealth Serum Laboratories which manufacture sera, vaccines, diagnostic agents, insulin and penicillin. Incidentally, Australia in 1944 was the first country in the world in which penicillin was available under control for civilian use.

As in this country the pharmaceutical industry in Australia has expanded through a national health service. The annual cost of free medicine in Australia is rapidly approaching £21 million p.a. Some 20 million free prescriptions are dispensed each year, about two per head of population at roughly £1 per prescription. This is over three times the average cost per prescription in Britain and approaches the American figure (see MANUFACTURING CHEMIST, January 1960, p. 1).

With a small population and a low incidence of disease making extensive clinical trials difficult, it is not to be expected that the Australian drug industry can engage extensively in research. In fact it largely relies on American and British research, but it supports with money and services the fundamental research carried on in the universities, the C.S.I.R.O. and the Institute of Medical and Veterinary Science. Australia has an excellent record of medical care and the drug industry can congratulate itself on its contributions to the national health.

Silver desalts water

AN agreement was recently signed between Fairbanks Whitney Corporation of the United States and the Israeli Government to set up a plant in the desert regions of the States to desalt sea water, making it suitable for domestic and irrigation purposes.

The process is based on Israeli patent 10737 (23.10.58), taken out by Dr. Alexander Zarchin, who experimented with waters of the Red Sea. In this process a slurry of silver sulphate precipitates the chlorides, the AgCl being treated with SO_2 steam to regenerate the silver sulphate for re-use.

The filtrate is treated with lime, precipitating magnesia, which is removed and roasted in a furnace. A further supply of lime is added with carbon dioxide under pressure, precipitating gypsum, leaving sodium bicarbonate in solution. The gypsum is heated at 1,200°-1,400°C. regenerating lime and the SO_2 and steam are used in converting the silver chloride to sulphate as described above. The bicarbonate solution is saturated with bicarbonate ions by adding magnesia (extracted previously) and carbon dioxide at 10-12 atm., precipitating sodium bicarbonate. The filtrate containing magnesium bicarbonate is treated with a further supply of magnesia forming magnesium carbonate which is separated from hot solution and heated at 800°-1,000°C. to regenerate magnesia and carbon dioxide, both of which are re-used in the process. The whole operation is therefore a complete cycle, is economical and will meet the needs of the desert in both Israel and the U.S.

It is also possible that the process might serve to prevent friction between Israel and her neighbours over the proposed diversion of the Jordan waters for irrigation under the Johnston plan.

Dr. Zarchin, the inventor, originates from Soviet Russia, whence he escaped in 1947 after serving sentence as a political prisoner.

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Two doctors collecting information for a clinical lecture to medical students on the average weekly cost of some widely used drugs and medicines came across some revealing facts about the national drug bill that are either overlooked or ignored by those people who think it awful that it rose 100% between 1949 and 1958—from £31 million to £62 million. (In fact if allowance is made for the falling value of the pound in those 10 years the real increase is 40%).

The doctors, Henry Miller and Michael Smith, of the Royal Victoria Infirmary, Newcastle upon Tyne, publish their conclusions in the *Lancet* (1960, (7114), 45-7). First they analysed the drug bill in terms of basic drug cost, on-cost (the pharmacist's profit of 25% on basic cost), container allowance (about 1½d.) and dispensing fee (about 1s. 2d.). This system has curious results. For instance, the basic cost of ½ grain of phenobarbitone three times a day for a week is 1d., but adding the other costs raises this to 1s. 4¾d., a 1,600% rise because of distribution costs. On the other hand, a week's treatment of terramycin costs basically £1 19s. 8d., which is raised to £2 10s. 10½d. by the other factors. Distribution costs can often be startlingly high and, indeed, the doctors reckon they account for about one-third of the drug bill. Since dispensing these days is often no more than putting pills in a bottle, they imply that distribution costs might be too high. The pharmacist, assailed by many other worries such as the attack on price maintenance, will hotly deny that he is being overpaid and no doubt most pharmaceutical manufacturers would support him. The skill and experience available to the general public in the ubiquitous local chemist's shop is vital to the Health Service and those who think it too expensive should offer a more economical fully equivalent alternative or keep quiet.

The fact remains that the pharmaceutical industry produces many drugs remarkably cheaply. New drugs are bound to be more expensive initially for reasons that are well known. Their justification is very often the saving in hospital costs that their speedy and convenient administration effects. For instance, oral penicillin is much more expensive than injections, but when given to a person who lives remote from a hospital or a doctor and for whom injections are impracticable, it handsomely

repays its cost. Unfortunately the savings effected by drug treatment are not put into Ministry statistics.

Dealing with the insistent Ministry demands on doctors to prescribe cheaper remedies, Drs. Miller and Smith have this suggestion: Let a small hospital be established for the controlled assessment of cheaper treatments. Locate it conveniently to Whitehall, so that it could at once serve the physical needs and satisfy the public spirit of senior civil servants and politicians. It is easy enough for these gentlemen to advocate economy, but if their own doctors prescribed second-best remedies for them would their public zeal remain unimpaired !

As we have often said before, the nation cannot have good medicine on the cheap. In fact, it is getting extremely good value from the pharmaceutical industry which, besides providing many drugs remarkably cheaply, is spending much more than the government and the universities upon the research which is essential to provide the best possible Health Service. A rise in the drug bill is an inevitable consequence of the present scientific revolution in medicine. As the two doctors remark: " An annual increase of 3-4% at a time of previously unparalleled progress in therapeutics seems to have caused quite disproportionate surprise and alarm."

Unity for medicine men

THE muti (medicine) men of the Federation of Rhodesia and Nyasaland have caught the prevailing African fever for unity and a common front, and have started the African Herbalists' Association of Central Africa with a potential membership of 2,300. Our Cape Town correspondent tells us that among the association's aims are: To standardise cures for stomach pains, rheumatism, sterility, impotence, madness and other ills with which men are afflicted; to fix standard fees for consultation and treatment; to issue certificates of competence for accredited medicine men; and to publish a book on the principles and practice of African medicine. In the Federation medicine men are called " ngangas " and are strictly not to be confused with witchdoctors. The chief " nganga," Dr. K. M. Nganga, while on a recent visit to Salisbury, Southern Rhodesia, said that part of the medicine man's job was to undo the harm done by witchdoctors. Dr. Gambera is the founder of the new association and hopes that it will receive official and other support. He has another job on hand. He is travelling through Central Africa collecting specimens of African remedies for the National Association of Medical Herbalists of Great Britain, which is to submit them to analysis. They hope to find valuable new ways of treating diseases from a study of African medicines, many of which go back hundreds of years. Recently Dr. Gambera took his collection to Salisbury, labelled and docketed with their names and uses. One of the items is a cure for being " possessed by devils."

C.N.S. drugs and anæsthetics: problems of addiction

AN interim report* of the Interdepartmental Committee on Drug Addiction, the chairman of which is Sir Russell Brain, deals with two particular aspects of the wider problem they are studying; first, drugs which have an effect on the central nervous system but which are at present obtainable without a doctor's prescription, and secondly, the extent to which anæsthetists themselves become addicted to the gases they are using, a matter which was the subject of a recent trial of an anæsthetist.

The committee had been asked particularly to consider carbromal and bromvaletone. These two drugs, they say, have attracted considerable publicity, one reason for this being that they are among the components of certain proprietary preparations which have been extensively advertised to the public, with the claim that they will relieve various mild, but widespread, nervous disorders. It was clear that these preparations had been widely used by the public, largely without medical guidance, because they could be purchased without a prescription. Cases of habituation arising in this way, it was noted, had been numerically very few but individually serious.

" What has become at once obvious to us," state the committee, " is that carbromal and bromvaletone are merely two examples among various drugs at present on sale to the public without restraint, the injudicious use of which may nevertheless be attended by dangers both to the individual and to the community."

They recommend that in general any drug or pharmaceutical preparation which has an action on the central nervous system and is liable to produce physical or psychological deterioration should be confined to supply on prescription. They further recommend that an independent expert body should be responsible for advising which substances shall be so controlled.

This recommendation of the committee was mentioned by the Minister of Health in a Parliamentary Answer on December 7. He stated that as an interim and urgent measure the Home Secretary was asking the Poisons Board to advise him which of such substances should be limited to supply on prescription so that they might be controlled for the time being under the Pharmacy and Poisons Acts, 1933.

Dealing with anæsthetic gases, the committee said there are some 1,500 doctors exclusively practising anæsthetics, and in addition, a number of general practitioners and resident medical staff devoting themselves in part to this speciality.

" It was represented to us," state the committee, " that with the apparatus at present in use the preliminary sniffing of the gases immediately before administering them to a patient is a recognised and

* Drug Addiction. Interim Report of the Interdepartmental Committee. Stationery Office. 6d. net.

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* Drug Addiction. Interim Report of the Interdepartmental Committee. Stationery Office. 6d. net.

indispensable precaution. Neglect of this measure in the first place might be tantamount to professional negligence. Furthermore, to the great majority of anæsthetists, such a practice offers no encouragement to addiction. With these views we are in complete agreement."

An accurate measure of the incidence of addiction of this kind was difficult to determine. So far as the committee could discover the number of cases which had come to notice over the past 11 years was under 20, and it was possible that this figure included persons counted more than once.

In the committee's opinion responsibility for dealing with any such irregularity rested in the first instance with the anæsthetist's professional colleagues. The committee realised that this raised ethical questions which were being discussed between the Ministers and the medical profession.

Advocacy for farm chemicals

CROP protection chemicals have been having a bad press. All sorts of people have been criticising them and their use with allegations that they " upset the balance of nature," " denude the countryside of plant and animal life " and so forth. These chemicals are fairly new and no one would deny that, as with all new inventions, mistakes can occur in their use. But to condemn them wholesale is to condemn the world to increasing losses of food and produce through the ravages of pests and diseases. Even in such a small country as ours, pests and diseases, if unchecked, could ruin some £140 million worth of crops each year, about a tenth of total farm output.

Undoubtedly the agricultural chemical industry is itself responsible for much of the appalling ignorance about modern crop protection. It has done far too little to remind the public of the value of its products. Now that the damage has been done the industry is trying to retrieve the situation. One of the biggest firms, Fisons, has started an educational campaign. For the industry as a whole, the chairman of the Association of British Manufacturers of Agricultural Chemicals has issued a statement in which he asserts, *inter alia*, that no crop protection chemical is marketed in the U.K. by members of the association until the risks associated with its use have been most carefully examined by the Ministry's expert committee. He presumably means the Ministry of Agriculture. He continues: " This committee was set up specifically to examine the possible risks of agricultural chemicals whether to the public, the farmer, or to wild life. Where safety precautions are thought to be necessary with any product, they are laid down by this expert committee and voluntarily accepted by the industry. As far as I am aware, no other products used in the U.K. are subjected to such rigid arrangements, yet these were not only entered into voluntarily, but were, in fact, suggested by the industry."

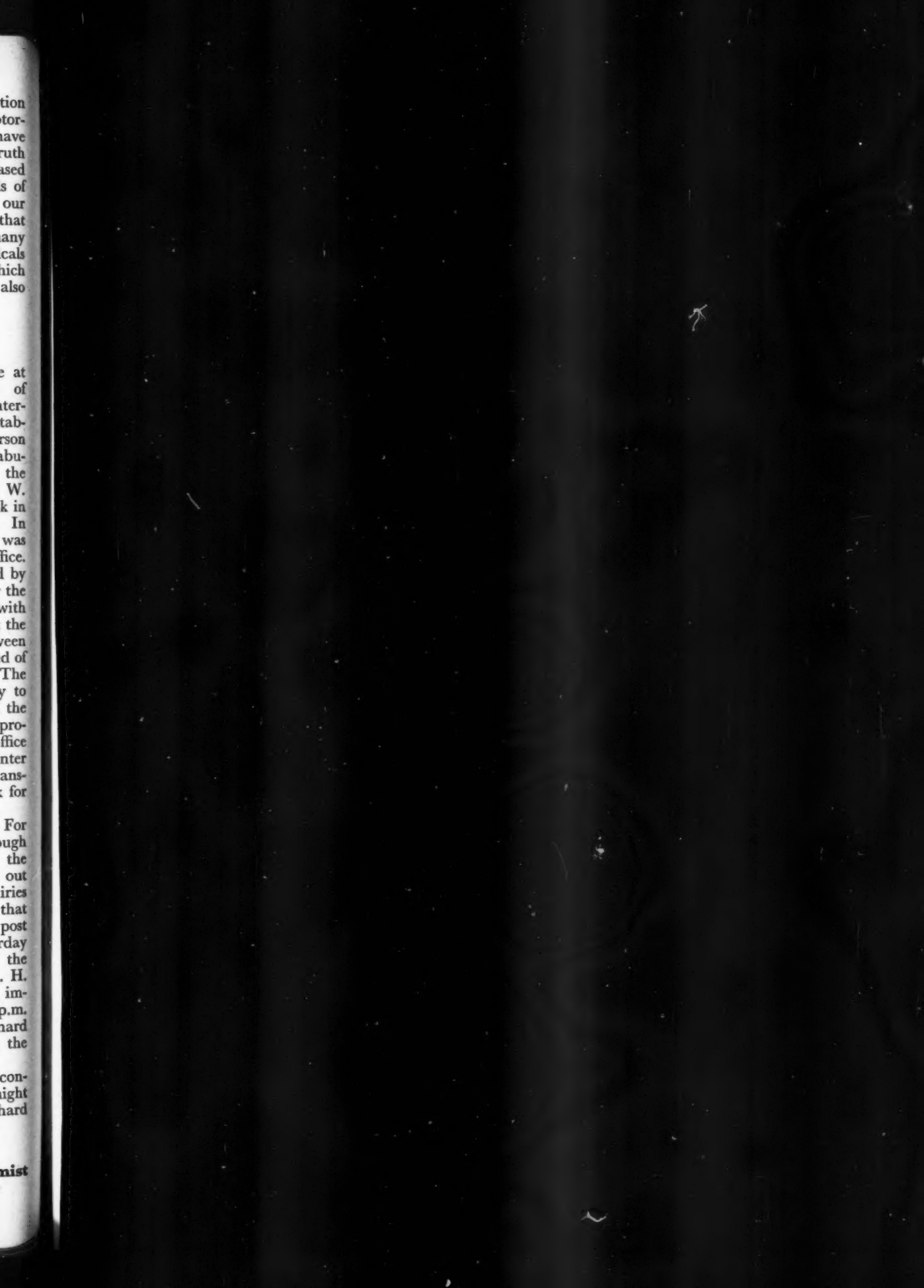
It is right that the public should be made fully aware of the industry's high sense of responsibility. We have to learn to live with crop protection chemicals the same as we have to live with the motor-car and the aeroplane. Now that A.B.M.A.C. have woken up they must keep on spreading the truth about their products. No one will be more pleased to help them than responsible farming journals of which one of their most tireless advocates is our associated journal *World Crops*. The editor of that journal, Mr. Frank Cooke, has published many articles and special features on agricultural chemicals and staunchly supports the objectives which A.B.M.A.C. are striving to achieve. *World Crops* also sponsored the Crop Protection Exhibition.

Chemical giants in 1891

THE opening of the £900,000 Brunner House at Winnington, Cheshire, as the headquarters of I.C.I.'s Alkali Division inevitably recalls the enterprise that John Brunner and Ludwig Mond established 90 years ago. There is at least one person living who can remember the days when the fabulous partners were still very actively running the business. He is a Winnington man, Mr. F. W. Merrill, now of course retired. He went to work in Brunner Mond's offices in 1891 as a boy of 13. In those far-off days, Mr. Merrill recalls, there was neither a telephone nor a typewriter in the office. All letters were transcribed in flowing longhand by three correspondence clerks. About a year later the first typewriter came into the office, together with a man from Liverpool to work it. There was at the time an " instrument of communication " between Winnington and Sandbach works. This consisted of a letter keyboard and a winding handle. The operator had to wind the handle continuously to supply current while tapping out a message on the keyboard with the other hand. A morse key provided a telegraphic link with Northwich post office and was the forerunner of the modern teleprinter network. The morse operator, incidentally, transferred to the teleprinter and continued to work for I.C.I. until 1945.

But some things were better in those days. For instance, the last post collection was 8 p.m. Although office hours were officially 9 a.m. to 6 p.m. the directors insisted that all quotations should go out the day the enquiry came in. As some enquiries arrived by the 4 p.m. post, this frequently meant that a boy would be kept waiting to dash to the post office before the last collection at 8. On Saturday mornings Sir John Brunner would arrive at the offices for long talks with the sales director, T. H. Forgan. These discussions often resulted in important letters being dispatched to catch the 4 p.m. post from Northwich to catch in turn the Cunard mail boat that left Liverpool at 6 p.m. for the United States.

The 700-odd staff who now work in air-conditioned comfort in their handsome offices might well remember the principles of duty and hard work that created such a great enterprise.



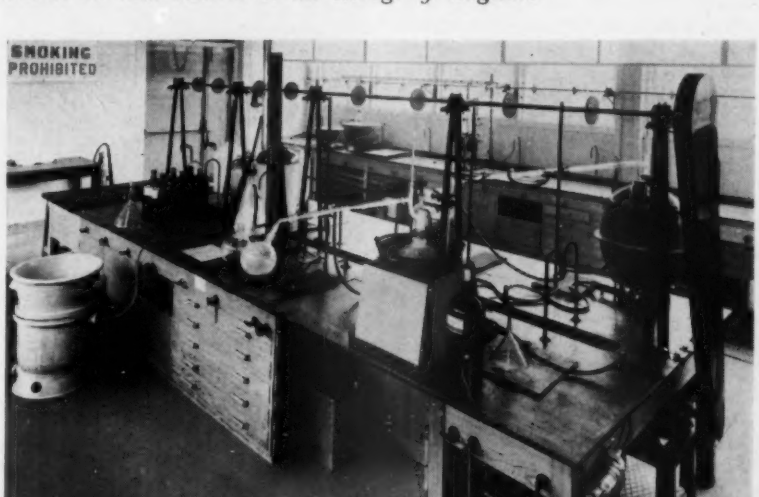
The Purity of Analytical Reagents

By J. T. Yardley,* B.Sc., F.R.I.C.

There is no more exacting task than the manufacture of analytical reagents, for the final products are subjected to the most minute and critical scrutiny by analysts having at their disposal a whole range of formidably sensitive instruments. Perhaps this is one reason why only a few firms today attempt to manufacture reagents. Looking ahead it is conceivable that one day many analyses may be carried out entirely by physical methods that would not require reagents, although pure chemicals would be needed still for calibration of the instruments. In spite of present and future difficulties, the reagent industry continues to provide analytical chemists with chemicals of remarkable purity—if price is considered. In this article the author discusses purity in terms of requirements and economics, considers the special requirements called forth by techniques such as polarography and gas chromatography, and comments on such matters as the storage of reagents.

THE purity of analytical reagents is a subject almost as comprehensive as analytical chemistry itself, and it is therefore my intention to confine this article to those aspects that assume the greatest interest and importance from the suppliers' point of view.

The reagent manufacturer's business is to supply analysts with the chemicals necessary for the proper conduct of their analyses, but, as we are all only too well aware, this situation is made immeasurably more complicated by the enormous number of applications that a given reagent may have in practice, and because it is impossible to produce any chemical in a completely pure state—indeed this last expression is virtually meaningless. Some form of purity specification is therefore an essential link between the manufacturer and the analyst and its aim must be to convey such information as will enable the latter to decide whether the particular grade of chemical will suit his proposed application.



One of the laboratories at Hopkin and Williams's factory at Chadwell Heath, Essex. In the foreground a small batch of toluene-3:4-dithiol is being vacuum distilled. The company specialises in organic reagents and "dithiol" and its newly developed derivatives provide for the efficient colorimetric estimation of tin.

In this country today, a very small number of manufacturers between them manufacture and distribute nearly all the high grade analytical reagents currently used and these are supplied, mainly, to specifications of purity that have been developed by themselves, based on the past and present requirements of their customers. These requirements become known to the supplier in a variety of ways. The nature of future specifications can be anticipated to some extent by the day-to-day routine enquiries and requests received by the supplier's technical service department and even more by the contacts made by senior technical staff at scientific meetings, congresses and similar gatherings. As a result of these contacts, new tests are continuously incorporated in routine use and eventually a proportion of them become part of subsequent editions of the published specifications.

* Chief Analyst, Hopkin and Williams Ltd.

Specifications

In this country there are, of course, analytical reagent specifications that have been published as appendices to the B.P. and to the B.P. Codex and the Vet. Codex, but, in general, these are not as stringent as the better proprietary standards. They are intended for different purposes and do not need to be. There are other specialised specifications published by trade associations and as appendices to certain British Standard specifications and so on, but the total contribution of all these to the overall sales, in my experience, is relatively small.

The Society for Analytical Chemistry, through its Micro-Chemistry Group, has also co-operated with several prominent

manufacturers in the compilation of specification methods and impurity limits for micro-analytical standards and micro-analytical reagents, and these are likely to become available during the next 12 months or so, although as yet the manner and medium of their presentation is not settled.

With this background in mind, it may be useful to review some of the considerations that affect the design of reagent specifications and the availability of reagents that conform to the specifications.

Since it is not practicable to devise any purification process that may be operated commercially in such a way as to remove all possible impurities from a substance, it follows that the processes adopted are based on compromise. They are, in short, aimed at removing most of the likely impurities together, if possible, with any others that would be objectionable if present adventitiously. Thus, for example, the processes used for purifying magnesium salts are specially concerned with the elimination of potassium, sodium and calcium, because these elements commonly occur in association with magnesium. Iron, on the other hand, might find its way into the chemical accidentally at some stage of the processing and, because its presence would be an embarrassment to many users, suitable limiting clauses are included in the relevant specifications.

The manufacturer does not and indeed cannot cover every conceivable eventuality in regard to his raw materials and processes, so that it is possible that a given sample might contain traces of the most improbable impurities. Even the smallest trace of contaminant is not likely to pass unnoticed by everyone. Modern analysts have at their command a formidable array of incredibly sensitive instruments and each analyst brings his (or her) instruments to bear on that aspect of the chemical that is of immediate interest to him. This means, in fact, that most batches of most reagents eventually come under minute and expert scrutiny from almost every angle.

Most analysts conduct the greater part of their analyses with the assistance of reagents that are, by the highest possible standards, only of moderate purity, but almost every one of them requires the occasional use of a few exceptionally pure

This laboratory glass-rig was used in part of an investigation into the best means of ridding distilled water of minute traces of organic impurities. The results are now utilised in the production of AnalaR water.

chemicals and some of these will be unique, or at least highly specialised. Such a requirement might well be called a tailor-made reagent as opposed to something "off the peg," and the analogy will extend also to considerations such as the price to be paid.

Costs

This question of cost is one that a high proportion of users do not seem to have considered very thoroughly, and it may serve a useful purpose to examine the case of the tailor-made reagent in closer detail. On receipt of a request for a non-standard specialised reagent the manufacturer is faced with two fairly obvious alternatives. Either he can examine all his stocks of the chemical in question and hope to select a suitable batch, or he can select an average batch and subject it to further purification to remove the unwanted impurities. Which alternative is followed will depend upon a number of considerations: upon the previous history of the chemical; upon his research and production programme, his plant resources, and upon the future prospects of sales of the speciality. In either case the additional cost must be passed on to the consumer, and although further processing will normally prove the more expensive alternative, the analytical charges involved in simple selection may be very considerable *in relation to the amount of material involved*. It is this last point that seems to escape general notice. With his standard lines the manufacturer may have to carry out extensive purification and strict analytical control, but provided that the result is of real benefit to a large number of users the costs can be spread and minimised. On the other hand, the extra costs incurred during the production of the "special" reagent cannot be equitably passed on to the general run of consumers by the expedient of upgrading the standard product, because the majority will not even be aware of the higher purity and, if they were, they would presumably see little justification for being made to pay for someone else's requirements.

This is an over-simplification of the problem because the situation I have depicted is duplicated over and over again: not merely because of the multiplicity of reagents, but because of the almost limitless combinations of reagents and impurities to be excluded therefrom. The upshot of it all may be that instead of attempting to remove more and more impurities by adding on extra operations, a completely new process can be devised in such a way as to raise the general level of purity to a point that will satisfy the several different specialist requirements without raising the price unduly. This, in fact, is the way that reagent chemicals are often developed and it is a moderately satisfactory way in so far as specialists and general users alike all get good value for money.

This sort of growth may sound rather haphazard, because the quality of the reagent ultimately depends upon the apparently unconnected specialist requirements of a large number of separate and isolated workers, but similar ends are just as frequently reached under a quite different type of stimulus.

Equipment

The last decade has seen very far-reaching changes in the kinds of equipment commonly used in analytical laboratories. In the prewar period the analytical balance was probably the most complicated instrument to be found in the average laboratory and even in the

immediate post-war years the situation had not changed very much, but nowadays it is necessary to equip an industrial analytical laboratory with instruments that will perform all kinds of operations and increase the sensitivity of almost every type of analysis.

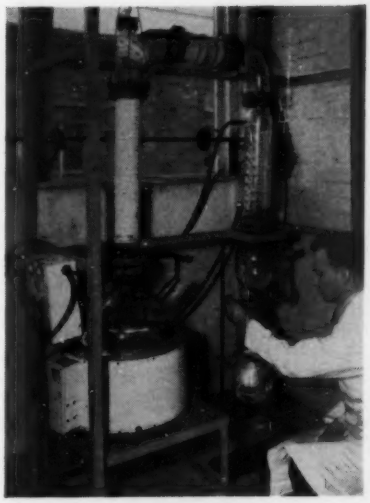
Whatever one's views on this state of affairs there can be no doubt at all that reagent purity has been very considerably influenced by this development. It is by no means exceptional, today, to find an industrial analytical laboratory equipped with a range of instruments, including a sensitive polarograph, ultra-violet and infra-red spectrophotometers, a flame photometer, an emission spectrograph and a gas chromatograph. In a year or two I should probably wish to add a photometer for molecular absorption spectroscopy and means for measuring nuclear magnetic resonance as well.

Almost all these instruments have been widely adopted only during the last seven or eight years, and almost every one has provided a more sensitive and discriminating way of estimating some class or classes of compounds. The reagent supplier, of course, has been asked to keep pace with these rapid advances. How far he has met the challenge is best left to the consumer to judge, but a brief examination of the way in which the introduction of one or two of these newer techniques has influenced reagent purity will serve to illustrate the vicissitudes of a chemical manufacturer's existence.

Polarography

Take polarography first. When this new method first swept the country in 1948-49 the opinions expressed about the purity of chemicals being used as supporting electrolytes were far from flattering. They were also mostly far from accurate, and as power cuts became less frequent and line voltages more stable a proper assessment of the situation could be made! As a result it was decided by my own company that a grade of specially purified and objectively tested reagents should be made available for use as polarographic base electrolytes. This was done and the reagents enjoyed considerable popularity for four or five years.

Towards the end of this period, however, two quite separate causes, operating in parallel, commenced to affect sales of these reagents. On the one hand many polarographers (whose normally sound judgment had by now been fully recovered) began to realise that AnalaR reagents were quite satisfactory for the majority of their requirements. On the other hand, new and more sensitive models were becoming available, as illustrated by the square wave polarograph which had a sensitivity several hundred times that of the earlier conventional models.



An inflammable liquid is distilled as part of its purification for use in ultra-violet spectroscopy. The material has already been purified by chromatography.

Users of these not only found " waves " in AnalaR reagents, but in the polarographic ones as well, so that the latter fell between two standards and therefore no longer filled a direct need, at the price. They were consequently suspended and it was decided to delay their reintroduction until such time as the demand for what might be termed a " square wave quality " had assumed sufficient proportions to justify a suitably improved grade, at a considerably higher price. At this point —and we are now up to the very recent past—the demand for sensitive physical methods and reagents to go with them was given a very considerable impetus by the rapid growth of atomic energy projects and of certain branches of the electrical industry, particularly semiconductor manufacture. The latter industry demands considerable quantities of high-purity chemicals for production purposes as well as for polarographic and other control work. In some instances, though not in all, the quality required for production is virtually the highest practically obtainable. Naturally these demands are as yet not completely satisfied, but my own company is now hoping to reintroduce a more highly purified series of reagents that should adequately replace those suspended earlier and at the same time should be useful for any project calling for chemicals having particularly low background levels of *all* types of impurities. In other words, they are of particular application when the user does not know exactly what specific effects a given impurity may exert or when he doesn't know what he does want! This situation seems to me to be particularly true of transistor technology. Here is a case where the relatively large-scale requirements of an industry are exerting a powerful influence on the availability of high purity reagent chemicals.

Some of the other physical techniques that have become popular have exerted equally powerful influences: some in a rather similar way, others in quite different ways. Most physical techniques require considerable ranges of reagents for their own ancillary use. Polarography is a case in point and so are ultra-violet spectrophotometry and gas chromatography. These require their own special chemicals, but they all (particularly the latter) exert a very profound *indirect* influence by revealing impurities often hitherto quite unsuspected in a wide selection of chemicals. To some extent the supplier is a rather helpless victim of this sort of progress and must learn to resist the temptation to discard a perfectly good process because some enterprising gas chromatographer presents him with a chromatogram showing a suggestion of a second peak. (And reminds him indignantly that his list describes the product as purified!) This road could lead to very considerable and unnecessary price increases if negotiated too hastily.

U.V. spectroscopy

However, as my earlier remarks implied, all types of instruments do not present the same difficulties. Ultra-violet spectrophotometry, for example, although a very sensitive tool, is far less widely applicable than gas chromatography and, ex-

cept in special cases, the supplier's main task is simply to provide the special solvents required. These solvents are worth mentioning because, in some ways, they represent one of the more straightforward problems, both from the preparative and from the analytical angles. They are, of course, all fairly simple organic liquids like normal and cyclo-hexane, aliphatic hydrocarbons and the lower alcohols and their only requirement is to be substantially free from impurities that might give rise to absorption in the 200-400 millimicron wave-band. In practice this means little more than freedom from aromatic substances and carbonyl compounds and the purification can be effected chromatographically; there being no need to resort to more time-consuming operations like fractional distillation because the presence of isomers, homologues and compounds that are generally similar does not normally detract from their usefulness. Moreover, as with polarographic reagents, the problem of specifying and of testing to the specification presents no difficulties whatever. It is sufficient to apply a completely objective test in which the solvent is used in a " blank " experiment on the spectrophotometer by comparing its absorption over the whole useful wavelength range with that of water or air. This kind of approach is ideal from the supplier's viewpoint and equally so from that of the specialist user, but we should distinguish sharply between the polarographic and spectroscopic examples at this point.

The examination of the polarographic chemicals (by polarography) does nevertheless provide sufficient information to ensure that they will be useful for a multitude of more diverse uses, but the spectroscopic examination of the solvents, and indeed the methods of purification used, do not fit them for applications outside their intended specialised field. This distinction, although obvious to the writer, is one that is not always recognised by purchasers.

There are many other specialised reagents that do nevertheless fulfil a much wider use than their description would imply. For example, the common acids and ammonia are available from several of the leading supply houses in multi-redistilled qualities that are primarily intended for use in the determination of lead in foodstuffs. By the very nature of the substances themselves, it follows that the processes of distillation used to rid them of lead will also rid them of the majority of other impurities. At least, this state of affairs applies to the distillate immediately it has been collected and, in principle at least, we have the means of satisfying the needs of the most discriminating analysts working in quite diverse fields. Unfortunately, however, the next stage: that of actually transporting the reagent to the user and of providing for its subsequent storage, even if only for a short time, creates severe difficulties. This problem is in fact much more difficult to solve than the problem of original purification, and it is with this aspect that I propose to dwell for a few paragraphs, because it exemplifies another typical difficulty that the supplier has to contend with and because it is essentially a part of the subject of our discussion.

Storage

Ordinary glass bottles are, of course, quite useless for the purpose because of the likelihood of lead contamination and the minimum requirement is a glass bottle that will not contribute to a significant increase in a lead figure usually of the order of 0·002 p.p.m., and a copper content of the same order. Rather strangely, perhaps, this requirement can be met by certain manufacturers of glass bottles, provided that the user is prepared to pre-pickle them in acids in the same way as one pre-treats analytical glassware to be used for delicate lead tests. Unfortunately, however, this seriously limits the usefulness of the acids so far as their application to the analysis for a number of other cations is concerned, for example, aluminium and iron.

Of the available plastics, PTFE is about the only one possessing most of the requisite chemical properties, but the material is not only expensive but its physical properties are not conducive to the production of bottle-shaped containers. Polythene, on the other hand, is not by any means an entirely suitable substitute for glass so far as strong acids are concerned; although if bottles of this material are pre-pickled in hydrochloric acid to remove traces of metals derived from moulds and in other ways, they serve tolerably well to contain this particular acid. The question of the compatibility of strong sulphuric acid with polythene is one upon which opinions seem to differ, but within my experience the result of contact between strong sulphuric (or nitric) acids and polythene is not predictable with any certainty. This observation is not meant to be equivocal. It means quite literally that if you place a number of apparently identical pieces of polythene in contact with a number of apparently identical samples of sulphuric (or nitric) acids, attack occurs in a not insignificant but quite unpredictable proportion of cases. The writer presumes the explanation to be connected with the treatment received during moulding, but it is by no means certain that the variation in properties is not of a more fundamental origin and connected with the original polymerisation. Polythene and perchloric acid are not incompatible in the cold, but there would be a potential element of danger in such a combination in the event of fire.

On the other hand, extremely pure hydrofluoric acid, of what is known as transistor quality, has been very successfully handled in pre-pickled polythene containers, but in this connection it is interesting to note that polythene is able to imbibe certain substances—nitrate ions, for example—and to release these rather gradually to certain acid or alkaline solvents. Rather more specifically, if a polythene container is used to hold a mixture of nitric acid and hydrofluoric acid (a mixture commonly employed for etching certain semi-conductor materials) it cannot subsequently be used to contain pure acids. Even if thoroughly rinsed with water, the container will release nitrate ions to any acid subsequently poured into it. Because of this one cannot safely reuse polythene containers for reagents of this class. There is a note to somewhat similar effect by Mr. L. S. Theobald of Imperial College in the September 1959 issue of the *Analyst*.

This is a problem that no one has settled really satisfactorily, but some of the new plastics like polypropylene may help. Packaging problems have in fact been the full-time concern of a number of senior people in our own organisation for some years, and research into new and better ways of bottling, storing and preserving high purity reagents will account for a lot of our time and effort during the next few years.

Standard substances

Most of the reagents that I have mentioned so far have been amen-

able to specification in more or less conventional ways. Standard substances, however, are not necessarily best dealt with in this way. For example, chemicals intended for use as volumetric standards cannot, in our view, be adequately specified, governed, described or controlled, in the same way as, say, barium chloride or lead acetate. In such a case it is the supplier's job to produce a chemical that the user may safely regard as having a higher probable purity than any other sample that may be available and that could be applied reasonably directly to the volumetric process or processes contemplated. By the nature of the problem it is axiomatic that the user cannot assay the sample. In order to do so, it would be necessary for him to possess a reagent of even higher purity, not to mention volumetric apparatus of very unusual accuracy. The suppliers' analysts are of course in no better position, and so the aim must be to convince the user that the chemical may be accepted as 100% pure without introducing any sensible error into his standardisation.

In the case of the PVS reagents that my own company issue, this situation is met by confining the range to those substances that have been shown to be readily amenable to purification and then by publishing details of these methods of purification as applied to starting materials of accepted reagent quality. What happens in practice may be seen by considering the latest addition to the PVS range, benzoic acid. The story is given quite concisely in the relevant description of the purification process that serves *instead* of a purity specification in the PVS brochure. It says, among other things:

"We have established that the passage of six molten zones through the column used is sufficient to purify the material to such an extent that, after discarding the obviously impure section, no difference in assay can be detected between the extreme ends of the remaining portion. In practice, eight zones are passed through the column and, after rejection of the impure section, the remainder is melted out, powdered in a glass mortar and then transferred to dust-free bottles."

This exemplifies the type of approach that we strongly favour in cases where exceptionally high assay-purity is the prime consideration. Whatever your reception of this may be—and opinions will undoubtedly differ—I submit that it would be meaningless to ascribe an assay figure to a product of this type—although we have sometimes been criticised for not doing so.

Glass-lined apparatus of this size and type is widely used for small-scale production of organic reagents. An assistant keeps a watchful eye on the temperature of the reaction mixture.

Unfortunately it is only too easy to devise what might be called "shaggy dog" specifications that look impressive on paper but do not really offer any very effective or meaningful guarantee, and in the forefront of this category I place assays expressed beyond the second place of decimals. Assays of this sort only really serve to check the standard solutions employed.

Having thus surveyed the present situation of the reagent chemical industry in relation to current demands being made upon it: what of the future?

Future demands

One or two developments seem almost certain. The instrumental side of analysis shows every sign of producing as many new and improved devices during the next 10 years as during the last and, as we have already seen, many new developments call for reagents that, in some special way or another, are better than their precursors. To some extent, therefore, we might expect an increase in the number of specialised grades of reagents that become available. For reasons that we have already examined, however, such an incipient tendency would be partly counteracted by the manufacturer, who would probably find it more convenient to offer the modern equivalent of the "Puriss" quality, combining the several separate attributes in one bottle. This will not always be possible, however, and the "specials" will be the only alternative.

In spite of these predictions it is perhaps unlikely that the reagents of the more immediate future will exhibit purity levels startlingly greater than those of the most stringent present-day specifications. The practical limit of purity of commercially-produced chemicals must ultimately be set by the plant used in their preparation, or perhaps more accurately by the plant used in their final purification. In the absence of a completely "noble" substance, be it metal or plastic, it is difficult to see how purities of a very high total order can be achieved, and one is apt to lose sight of the fact that micro-amounts of one substance, present as a reagent impurity, might interfere significantly in the estimation of millimicro-quantities of another. In other words, the *ratio* of impurity to substance determined is important. Few reagents today contain less than one or two hundred parts per million of *total* impurities, and probably none would prove to contain less than 20 or 30 if sensitive methods for detection of all elements in all possible combinations could be applied. This state of affairs will no doubt be gradually improved, but, in the writer's view, the key to the next move is not in the reagent manufacturers' hand at the moment. It will ultimately be given to him by the manufacturers of plastics, but perhaps not for some time yet.

It is quite possible, of course, that the demand for analytical reagents of really extreme purity might not materialise, in practice, if certain types of physical approach are developed. Already in certain fields, such as transistor technology, the ultimate purity tests are almost entirely a matter of electrical measurements, and it is not difficult to imagine modified forms of several

(*Continued on page* 63)

DRYING PLANT — Progress Towards Economy and Efficiency

By J. Lomas

Designers of drying plant for chemicals and pharmaceuticals have concentrated to a considerable extent on ensuring adequate circulation and recirculation of air over the material being dried, so as not only to maintain high capacity, but also to obtain minimum consumption of heat. It has been found that the most economical practice is to circulate the air repeatedly over and across the material as it passes through the dryer, because each passage of air over the material means a shorter length of air travel and reduced friction and power consumption.

THE efficient drying of fine chemicals and pharmaceutical products, whether of fibrous, crystalline, liquid, slurry, or powder character, depends upon the value of the material treated. Obviously, great losses can be incurred if the process is not properly adapted to the substance dealt with and drying is not effected in a thoroughly scientific manner. It is clear, therefore, that any drying system to meet stringent modern demands must be based on principles adaptable to the class of material to be treated, must be economical in construction and operation, and thermally efficient.

The removal of moisture from a material is extremely complicated by reason of the physical and chemical properties of different materials. The water may be on the surface only, or distributed throughout the entire body of the material. The water on the surface will evaporate readily, but the internal water must first diffuse to the surface before evaporation can take place. The rate at which it diffuses depends on the texture and structure of the material, the size of the individual particles, and the temperature, velocity and humidity of the drying air or gases.

These factors all influence drying, and cannot be assessed by preliminary theoretical calculations only. They must be studied experimentally. Extensive laboratory experiments, and where possible actual drying tests on a semi-commercial scale, should be undertaken to determine the unknowns as far as possible. The results of such analysis, laboratory experiments and tests must be suitably interpreted, and it is precisely at this stage that the services of the experienced drying engineer become indispensable, because without his practical knowledge of how to apply the theoretical calculations, commercially successful results are much more difficult to obtain.

One of the most important modern developments in drying is, in fact, the provision by manufacturers of drying plant of testing stations where samples of the user's materials can be dried in small-scale units of different types. In these units it is possible to reproduce closely the actual conditions that will prevail in a commercial-sized plant. Often no charge is made for such tests, which can be witnessed by the user; but it is wiser to assume that a minimum fee for the service rendered will be charged. Much will depend on the amount of work involved and the complexity of the tests required.

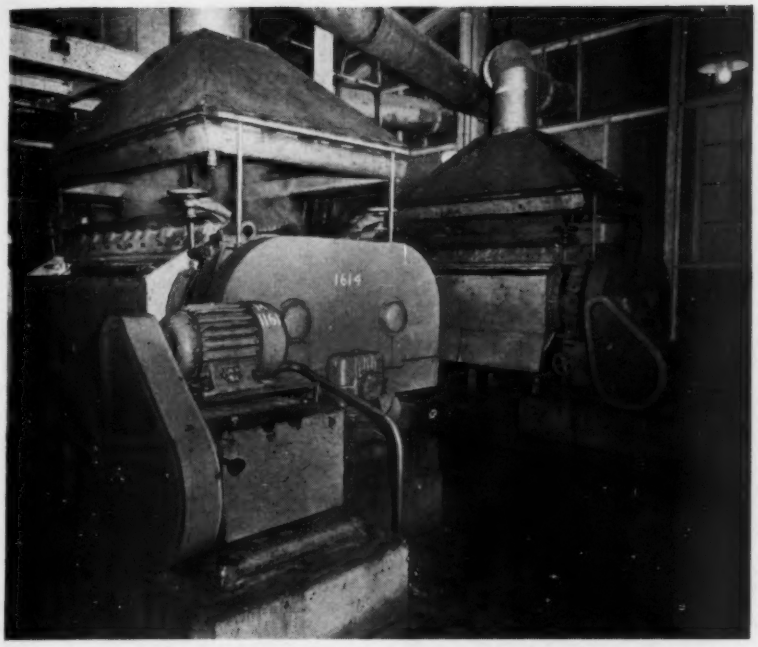
Modern dryers may be divided into two classes, the rotary and the stationary. Alternatively, they may be classified into continuous or batch, adiabatic or constant temperature, and also according to the way in which the necessary heat to vaporise the water is transferred to the material being dried. Among the most important modern drying machines for the drying of a wide variety of fine chemicals and pharmaceutical products is the film dryer, of which there are many different types with varying methods of feed.

Film dryers

One of these is manufactured by Manlove Alliott and Co. Ltd. The product is spread on the roll in a thin film, which allows of extremely rapid evaporation, even where the products have insulating powers. The rate of evaporation compared to the heating surface is normally very high. As the drying time is short, namely, from 3 to 20 sec., according to circumstances, heat-sensitive materials can be dealt with. Products that stick or jam or form impermeable masses in other types of dryers can often be handled most successfully. The dry product is delivered as a fine or coarse dust, in flakes or sheets, according to its composition and physical properties. Fineness, density and quality are often controlled by modifying the feed concentration, the method of feeding, the steam pressure, or the speed.

There are single, double and twin-roll types, provided with feed devices and scraping arrangements. Single roll film dryers are very suitable for dusty products, because the knife can be adequately enclosed without hiding the film of dry or nearly dry product which is just approaching it. All working parts are highly accessible. The twin roll film dryers have high capacity in small space and form an even film, the product in the feed trough being fed downwards between the rolls. Many products foam vigorously in this trough, so that much evaporation takes place before the film is deposited. The knives cannot easily be fully enclosed, nor will twin rolls handle materials forming or settling into hard clots or of highly abrasive character so well as the single roll machines.

Double roll film dryers comprise a pair of single rolls mounted out of contact on a single framework, and do the same work as the single rolls. They are suitable for roller, dipping trough, splash or spray feeds, but cannot easily be used with slide feed troughs. Operation is like that of a pair of single rolls, and they are not allowed to meet or form a nip. They are also suitable for handling dusty



Two 94 sq. ft. Manlove Alliott film dryers producing dried whey in a medicinal food factory.

products. Because of inaccessibility and the possible feed arrangements they are used only for products giving no feeding difficulties, cloggy deposits, etc.

In the Manlove single roll film dryer the flexible knife is dropped into position behind a backing plate and held in place by a pressure plate or plates. A traversing device can be fitted to give a shearing action on the film to be removed, which helps when a hard deposit builds up on the roll or the film is abrasive and causes roller or knife wear locally. A side trough feed is the simplest, but a roller film is used when such a feed does not give an even or thin enough film.

A similar range of film dryers is made by Richard Simon and Sons Ltd. These are of both single and twin cylinder types. They are made in sizes ranging from 18 in. dia. by 18 in. long., to 48 in. dia. by 144 in. long, and are suitable for working steam pressures up to 80-100 p.s.i. (dry, saturated). The Simon film dryers are arranged for nip feed, in which the material is fed into the valley formed between the two rolls; dip feed, in which it is fed into a trough below, the roll or rolls dipping into this to pick up a film; splash feed, in which the film is splashed on to the cylinder by means of a rotor or rotors below the roll; and feed rolls, top, bottom, and with or without water-cooling. Traversing feed gear is also provided.

Film dryers are suitable for drying detergents, aryl alkyl sulphonate, sodium sulphate, DDT, dyestuffs, copper sulphate, fine chemicals, white lead, colours, starches, gums, yeast, and many other substances. By a simple modification, they can be offered as flaking machines or coolers for naphthalene, lard, etc.

Vacuum drying

Vacuum drying plant is coming rapidly to the fore, and a special vacuum plant for freeze-drying streptomycin has recently attracted much attention. It is made by Edwards High Vacuum Ltd. and was exported to Czechoslovakia. This machine will freeze and dry 300 litres of streptomycin salt to a moisture content of 1·5% in a 22 hr. cycle. If necessary, even lower moisture contents are obtainable by proper modification of temperature and drying time.

In this plant there are three identical drying chambers of cylindrical type, vertically placed and in two sections. At the top of each chamber is a metal bell capable of being hoisted by cable. With the bell lowered and in place, this section of the chamber contains a vertical stack of 10 shelves with a total shelf area of 110 sq. ft., 3½ in. space between the individual shelves. The shelves mounted above the bottom half of the chamber and projecting into the top half are prevented from fouling by guides, which also prevent rotation of the bell. The two halves of the chamber are specially sealed.

Each shelf supports four stainless steel trays with lids, and allows vapour to flow while trapping airborne bacteria. Each lid has a filling hole and another to take a thermocouple junction. Maximum chamber capacity is 100 litres. The shelves can be refrigerated to −35°C. or lower by circulation of cold alcohol.

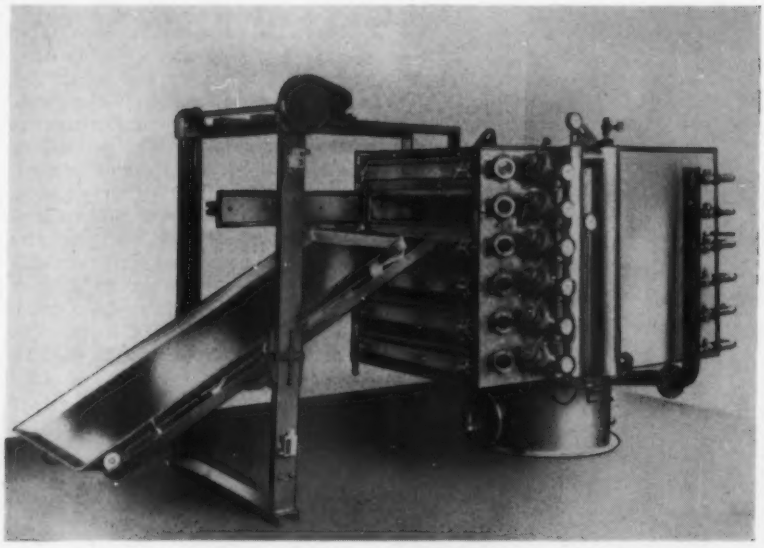
There are many other interesting features of this plant, such as condenser coils, defrosting equipment, rotary vacuum pumps, recording and control instruments, etc.

W. J. Fraser and Co. Ltd. have designed and manufactured a horizontal vacuum dryer for the batch drying of wet solids under vacuum. This comprises a horizontal cylindrical vessel jacketed for the full length, with coil heating on the end closures. Along the full length of the vessel, a heavy, slow-moving, close-fitting, ribbon agitator is fitted. This has internal chains to assist in the breakdown of any lumps forming in the product. The agitator is externally driven by a direct-coupled worm reduction-unit and the agitator shaft supported by external bearings mounted directly from the end plates of the vessel. To seal the shaft where it passes through the vessel, large vacuum/pressure type mechanical seals are used. Two discharge outlet branches are incorporated. These have specially-designed hinged doors, and in the hopper immediately beneath the doors further agitators are fitted to avoid build-up of solids in the outlet chute.

New design shelf dryer

A new design of vacuum shelf dryer made by Calmic Engineering Co. Ltd., is available in two types and is intended for the drying of delicate materials sensitive to heat and oxidation.

As each dryer is composed of a number of independent compartments which can be operated semi-continuously, materials can be dried in one compartment while other compartments are being loaded. Owing to the compartments being small, normally 30 mm. Hg absolute can be obtained within one minute



The C.51 Calmic vacuum shelf dryer, a continuous working six compartment machine made of stainless steel.

of closing the door of the vacuum chamber.

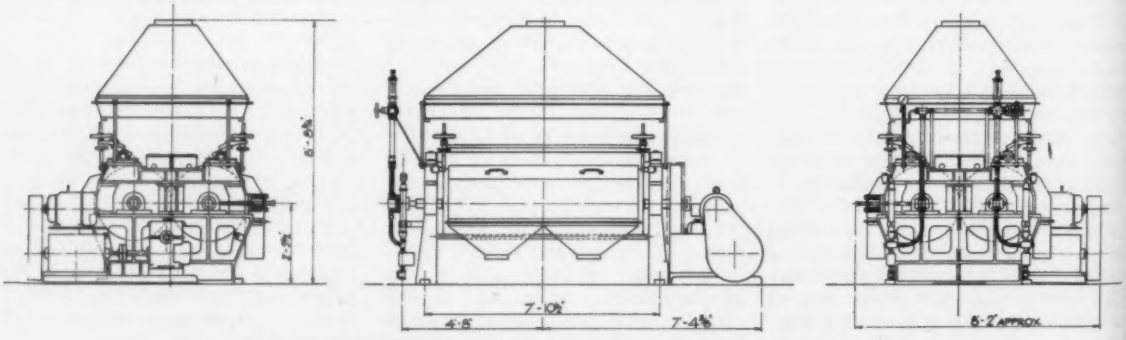
The two types of "A.L.A." vacuum dryers are the C-3 and C-51. The C-3 has four non-jacketed trays in each compartment and oil circulating round the outside of the compartments as the heating medium. This type of vacuum dryer operates from 0° to 302°F. (0° to 150°C.), according to the material.

The C-51 type, in addition to steam or hot water heating in the space between the compartments, has jacketed trays in which subatmospheric or vacuum steam is used. This jacketed tray gives high heat transfer rates in the temperature range for which this machine is designed, *i.e.* 95° to 194°F. (35° to 90°C.). Evaporation with free water at 194°F. (90°C.) is 5 p.s.f. (2·4 gm.s.cm.) per hr.; at 140°F. (60°C.) the figure is 2¼ p.s.f. (1·09 gm.s.cm.) per hr. and at 95°F. (35°C.) the figure is 0·5 p.s.f. (0·2 gm.s.cm.) per hr., whilst the efficiency when working with most products is in the region of 1·1 to 1·3 steam per hr. water evaporated.

Units are available with trays approximately 3 ft. by 6 ft. (915 mm. by 1,829 mm.) and with from two to six trays per machine, each compartment having one tray only, and being operated entirely independently. A pilot machine of this type is also available with a single tray having an area of 3¼ sq. ft. (0·3 sq. m.). All these machines are available either with all contact parts in stainless steel or part stainless, part mild steel.

In operation the cylindrical chamber under the C-51 dryer is partly filled with water and partly filled with subatmospheric steam. Live steam is allowed to enter into the chamber by a thermostatic controller with a bulb in the water. This controls the temperature of the vacuum steam leaving the chamber before it passes through the pipe to the valves at the back of the unit. Special stop valves at the back of each compartment are arranged so that no vacuum steam passes through unless the tray is inserted into the oven. Vacuum steam passes into the tray jacket and leaves as either steam or condensate through a small nozzle on the side of the tray. This nozzle discharges immediately into the opening of the appropriate vacuum valve on the right-hand side of the dryer. Steam and condensate together with the vacuum from the drying material pass through a water sprayed condenser to the vacuum pump. The top and the bottom of each compartment of the dryer are also heated with steam coils to prevent condensation during the drying process.

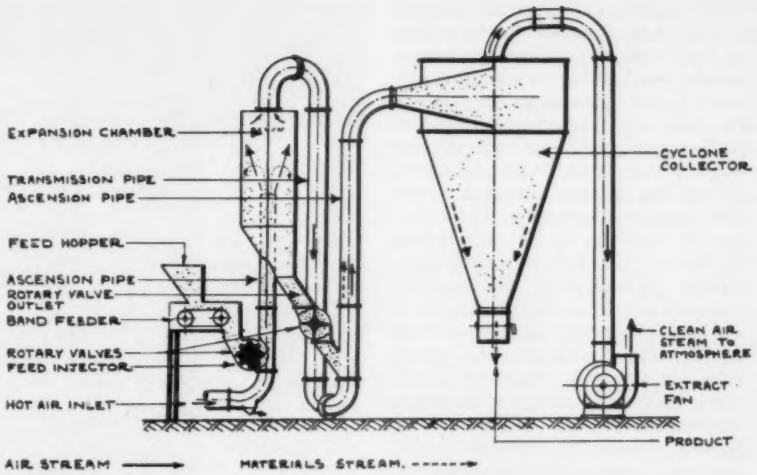
Both the C-3 and C-51 types of vacuum dryers are available with an elevator for loading and unloading the trays. This elevator is electrically operated for the large models and mechanically for the small units. The elevator not only assists in the loading operations but also minimises damage to the trays, as they never need leave the elevator. When continuous operation is required, material can be fed on to the tray on the elevator from a chute above and discharged from the tray by simply tilting the tray over a bogie or conveyor.



30 in. by 72 in. two-roll film dryer by Manlove Alliott and Co. It has 94 sq. ft. of drying area and operates at 2 to 12 r.p.m.

Vacuum pumps of both reciprocating and water ring types suitable for use with the Calmic dryers are also available. A 70 cu. ft. (2,000-1) per min. capacity reciprocating pump can be used with two machines of six tray C-51 size type and operates on a minimum vacuum of 30 mm. Hg. absolute. The casing is of cast iron with a piston and rod of chromed nickel steel or alternatively, with piston, piston rod, valve covers and cylinder liners of acid-resisting bronze. As this pump requires at least 1½ gal. (6·8-1) per min. for lubrication purposes, it is well suited for working with a spray condenser.

A 56 cu. ft. (1,500-1) per min. two-stage water ring pump is usually used with a single dryer up to the fifth tray size and this is capable of operating to a vacuum of 20 mm. Hg absolute. This pump needs a minimum of 3 gal. (13·6-1) water per min. for maintaining the water ring and is therefore also suitable for working with a spray condenser. Both types of vacuum dryer, however, are available with surface condensers according to the requirements of the material.



Arrangement of the British Rema pneumatic dryer.

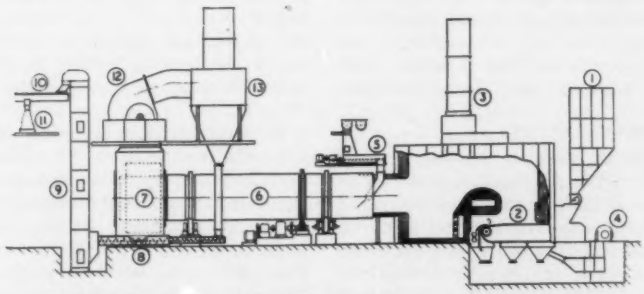
Drum dryers

The first attempts at drying materials led in due time to the invention of the rotary or drum dryer, which endeavours to provide improved thermal efficiency, minimum wear and tear, freedom from breakdowns, and economy in space requirements, *i.e.* to dry at the lowest ultimate cost. There are many different types, most of which, however, embody the same general principles, but differ importantly in their method of construction and arrangement. For example, the rotary drum dryer made on the Buttner system of cross-shaped shelving is claimed to achieve the most effective distribution of material over the cross-section of the drum, so exposing maximum surface to the drying gases. This form of shelving is said to allow a greater filling factor than the normal "lifter blades" for a given drum diameter, but it also prevents uneven gas speeds and eliminates areas where the drying gas can pass through without meeting any material.

Drum or rotary dryers are provided with means of heating a current of air, which passes down a central tube and then returns through an annular space between this tube and the outer shell or cylinder. (There are, of course, single shell dryers, but these are relatively crude.) As the gases are comparatively cool by the time they enter the annular space, radiation losses are low and no heat is wasted in raising the material to an unnecessarily high temperature, so that materials can be dried without serious reduction of volatile content or risk of ignition.

In the Buell drum dryer referred to, material and heating gases travel through the drum in the same direction, allowing high inlet gas temperature to be used even with combustible material, because the hottest gas meets the wettest material at the feed point. Passage of the material is achieved partly by the gravitational effect of the cascading material in the inclined drum, and partly by the carrying effect of the flowing gases. Thus, with ungraded material, the larger pieces needing longer drying time stay longer in the drum, the smaller particles passing out more rapidly. This gives a uniformly dried product irrespective of particle size.

Rotary drum dryers can be used for the drying of such materials as nitrate of soda, lead salts, rubber filling powders, salt, sugar, sulphate of ammonia, bran, liver salts, copper sulphate, lead salts, and many other materials. Manufacturers of this type of equipment include Buell (1952) Ltd., W. J. Fraser and Co. Ltd., Manlove Alliott and Co. Ltd., Head Wrightson, Stockton Forge Ltd., and Edgar Allen and Co. Ltd.



1. Coal Bunker
2. Travelling Grate.
3. Emergency Stack.
4. Forced Draught Fan.
5. Wet Feed Conveyor
6. Drying Drum.
7. Dried Product Outlet (Vapour Discharger and Governor Gear.)
8. Discharge Conveyor
9. Elevator.
10. Bagging Conveyor
11. Bag Weighing Machine.
12. Vapour Fan.
13. Dust Collector.

Arrangement of the Buell drum dryer.

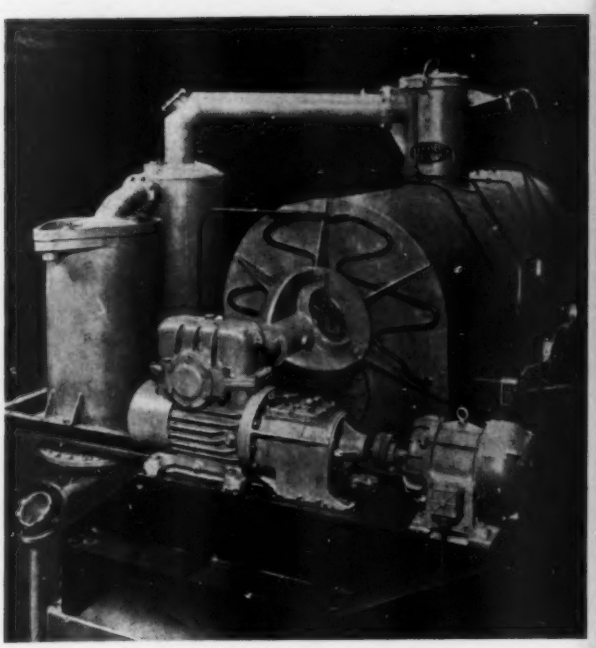
"Turbo" dryers

The "turbo" dryer of tray type is a machine specially designed for

such diverse products as slurries, pastes, chemical and other products in the form of powders, crystals or lumps, etc. The outstanding feature is the air-circulating system. In most instances the air enters at ordinary atmospheric temperature at the point where the dried material leaves the drying chamber. Turbine fans running at slow speed subject the air to a gentle, wafting movement so that it progressively spirals through the dryer in the opposite direction to the material. In passage it is repeatedly heated by elements built into the drying chamber and makes repeated contact with the wet material. The heating elements have diminishing spacing, so that the air is gradually heated in direct proportion to the increase in saturation from moisture picked up, and is finally discharged, at its highest temperature and highly saturated, at the point where the raw wet material is fed in. The essential difference between this system and others is that the air has only one function, to absorb moisture up to the practical limit of its carrying capacity.

This machine is also made by Buell (1952) Ltd.

Another drying system is the use of a revolving reel of steam-heated tubes, the material being fed in at one end, passed over and among the tubes, and conveyed along the machine to the outlet, where it is discharged, the entire process being automatic and continuous. The machine can be operated with either live or exhaust steam. Machines of this type are suitable for drying a wide range of materials, such as fine chemicals including quarried and precipitated chalk, whiting, white lead, barytes, sulphate of ammonia, wood meal, etc. Machines of this type are manufactured by Richard Simon and Sons Ltd., and Manlove, Alliott and Co. Ltd. W. J. Fraser and Co. Ltd. also make a horizontal steam-jacketed vacuum dryer, 4 ft. dia. by 12 ft. in length. This is provided with helical scraper blades and a variable speed gear to allow for stiffening of the charge during drying (*vide supra*).



Horizontal vacuum dryer by W. J. Fraser fitted with a heavy, slow-moving, close-fitting ribbon agitator.

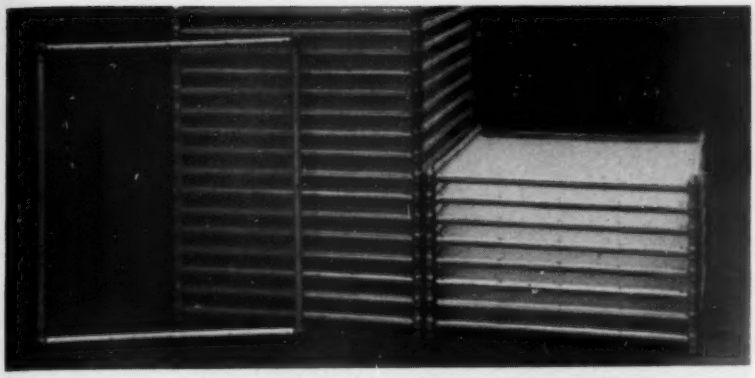
Spray dryers

A brief reference should also be made to the Büttner type spray dryer, which is claimed to be the latest development in the drying of materials from the liquid state, such as coffee extract, soap, detergents, egg, milk, etc. This is made by Buell (1952) Ltd., London. The principle of a machine of this type is the drying of the liquid by spraying it into heated air, the large surface of contact between the drops and the air rendering possible a high evaporation-rate. If the dry material is insensitive to heat, the solution may be superheated and sprayed into a rotary dryer or heated chamber and the dried product collected as a powder. When a finely ground product is required both drying and pulverising can be achieved in a single operation. The process can also be used to obtain a homogeneous mixture from a solution or suspension of two or more substances. The process should be employed only where the short heating time is specially advantageous, and it is said to be the only method of obtaining dried glucose as a powder. It is not economical for cheap materials.

Pneumatic dryers

A brief mention should also be made of the pneumatic dryer made by the British Rema Manufacturing Co. Ltd. In this, the wet material is delivered from an overhead bunker to a feed hopper and fed by band feeder. Hot air or gas is drawn through the system by an exhauster fan, and travels up an ascension pipe at a velocity sufficient to lift the material vertically. Handled by a rotary valve, the material is then thrown downwards into another ascension pipe and meets the column of rising hot air. Arrested by the flow of hot air, the stream of material has its direction reversed and is accelerated up to the speed of the rising stream of hot air. This action takes some seconds, during which the material is gradually arrested in its downward flow, reversed, and then accelerated up to the speed of the rising air stream. During this period all particles are separated and swept by the high velocity hot gas or air stream, so that extremely rapid transfer of moisture from the material to the hot air stream takes place. The drying action is said to be so rapid and effective that up to 15% moisture may be extracted in a 3 ft. length of pipe, and the temperature of hot air will fall from a starting temperature of 1,000°F. to 400°F. before entering an expansion chamber.

When the material is being carried upwards by the rising hot air, the drying action is much reduced, as there is no relative movement between material and carrier. In the expansion chamber the increased diameter reduces air velocity, so that the material cascades and gravitates towards a rotary valve outlet, while the air leaves the expansion chamber at the top. Thus, the material going down to the bottom outlet must again pass through the



These tubular metal, stackable drying trays have been used for some time in the glue and gelatine industry and are now being introduced to the pharmaceutical industry. The standard filling is stainless steel mesh but plain, perforated or expanded sheet in any material can be supplied. For instance, one pharmaceutical manufacturer has specified nylon mesh filling which can be easily removed and maintained in good condition. This manufacturer reports that the trays give maximum airflow top and bottom, so reducing drying times. Stacked units give efficient drying over the drying surface. The cost is said to be no more than that of conventional trays. Makers are Edward Wilson and Son Ltd.

rising hot stream and a second drying action takes place. A third drying action is also achieved, and ultimately the material is discharged to a cyclone collector.

This type of dryer is specially suitable for flaked materials, crystalline products, and many other substances.

Stainless steel parts

One of the most interesting features in the development of modern dryers is the employment of stainless steel in their construction, with a consequent improvement in length of effective service by reduction of corrosion. Typical parts that are now being made of this material whenever circumstances justify it include canopies for the removal of vapours, lifting flights, shells, trays, dam plates, knives, etc.

Other stainless materials which are coming into ever wider use in the drying of materials include stainless-clad steels, in which a sheet of low carbon steel is backed by a thin sheet of stainless steel; or sometimes sandwiched between two such sheets; the high nickel-copper alloy known as Monel metal; pure nickel; lead-lined mild steel; and a considerable number of other special heat-and-corrosion-resisting alloys.

Industry's Publications

Products of the rare earth group is the title of a Johnson, Matthey publication describing the properties, characteristics and availability of a potentially valuable and very topical range of materials.

New techniques have also been applied to the production of the rare earth metals and all the fourteen "lanthanons" that occur naturally and the related elements scandium and yttrium are now available in a state of high purity. All of the 16 metals have been remelted into ingots or rods. Lanthanum, cerium, neodymium, praseodymium, yttrium and gadolinium have been successfully extruded, and subsequently drawn to fine wire.

Iodine tests and reagents in chemical analysis, published by the Chilean Iodine Educational Bureau, is a booklet designed to assist analytical chemists, especially those in biochemical and pharmaceutical laboratories. Iodine and its compounds are needed in almost every branch of analytical chemistry. These pages amply illustrate the variety of spot tests and special reagents in which they are employed. The detection of sodium sulphite in meat, the identification of mercerised cotton, the differentiation of boiled and unboiled milk, and the qualitative determination of mercury, thallium, selenium, blood sugar and benzathine, are some of the techniques described. The tests and reagents are numbered and grouped alphabetically according to the names of the elements, radicals and compounds detectable. Where more than one procedure is available the arrangement is based first on the year of origin of the relevant scientific paper and second on the name of the author. An author index is also provided.

Titanium Corrosion Resistance. I.C.I. Ltd., Metals Division, have published the third in a new series of brochures on wrought titanium which will cover properties, corrosion resistance, fabrication and weight tables. Details of the behaviour of titanium in a wide range of pure substances and industrial liquors, and in a variety of conditions, are given in tables and some general observations indicate those environments in which the advantages of titanium are most significant. I.C.I. Metals Division produces wrought forms of titanium, such as sheet, strip, bar, tube, extrusions, wire and forging stock, extensively used in aircraft manufacture and as a constructional material in a much wider range of industries.

ANALYTICAL REAGENTS

(*Continued from page* 57)

existing physical instruments that might between them eventually embrace the majority of analytical determinations on either a reagentless basis or with the necessity for only one or two reagents, at most.

Such a horizon would not limit the future of the reagent chemical industry, because the very projects that breed the physical testing techniques also call for chemical materials, for process work, that are at least of present-day reagent quality. It is likely, too, that the instruments will create a fresh demand for pure chemicals for their calibration. Whether you call the products reagents, fine chemicals, process intermediates or anything else that may seem appropriate, the fact remains that reagent manufacturers are the people who have the experience, the plant and the know-how to supply what is needed. In the last few years more and more industries have been making use of this potential to satisfy their requirements for bulk chemicals in a state of reagent purity.

Gelatine and Glue Liquefiers in Industry and Research

By A. Courts,* B.Sc., Ph.D., F.R.I.C.

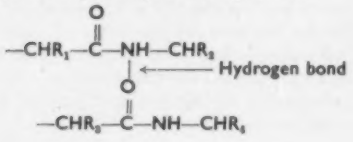
When gelatine and glue are warmed the hydrogen bonds which hold the gel structure together are ruptured and the jellies liquefy. The same effect can be achieved by chemical means. Many fairly simple reagents have been found to be hydrogen bond breakers and their possible advantages as gelatine and glue liquefiers are discussed in this article.

GELATINE and glue are chemically related and may be regarded as the products derived at different stages of the extraction of collagen into hot water. Collagen is the principal protein of animal skin, tendon and bone, and it is generally chemically pretreated in order to ease its conversion into water soluble proteins. Bone glues are made by autoclaving bones at about 135°C., without chemical pretreatment, followed by hot water leaching.

Gel structure

A glue or gelatine jelly may be regarded as a solution of a special type of protein in water. In a normal aqueous solution, molecules of solute are free to move about in a random manner, unless the water is frozen, when this movement becomes impaired. In jellies it is the protein which brings about the transition from the liquid to the solid state at ordinary room temperature. This property of gelatine and glue arises from its special chemical composition and structure. These products contain long thread-like protein molecules which have the ability to attract each other to form a stable structure. The centres of attraction which join adjacent molecules consist mainly of "hydrogen bonds." Although individual hydrogen bonds are comparatively weak, a number of them acting collectively may enable a very stable network of closely packed molecules to be formed. It is probable that gelatine in particular, and glue to a lesser degree, are very well endowed with hydrogen bonding sites.

The hydrogen bonding takes place mainly through the keto-imide (CONH) groups of the protein:



Proteins owe their construction to long sequences of this type, where the R-groups may have about 20 different possible structures. If the R-groups are large the molecules may not be able to approach closely enough for hydrogen bonds to form. In the gelatine group of proteins about one-third of the R-groups are quite small, a condition which obviously favours hydrogen bonding.

Liquefying a gel

Disrupting the hydrogen bonds of a gel structure causes liquefaction. This is, in fact, what happens when jellies are warmed; the gel structure breaks down because hydrogen bonds are not very stable between 20-40°C., and have only a transient character above 40°C.

Another method of liquefying a jelly is to introduce reagents which disrupt hydrogen bonds without necessitating any rise in temperature. Certain compounds with this property have been known for many years although the manner in which they work has only been understood more recently; thiourea and ammonium thiocyanate, for example, were used in the manufacture of liquid glues before 1920.

Experiments and results

Recent research from these laboratories has shown that a large number of reagents can be effective as hydrogen bond breakers and most of them are quite simple inorganic or organic molecules. A test was devised to show the efficiency of a compound as a gel liquefier:

Powdered gelatine was sieved in order to obtain a fairly uniform granular size; ½ g. gelatine in a stoppered test-tube was allowed to swell in 5 ml. water for 30 min. at 18°C. The reagent (5 ml.) was added and the swollen mass agitated with a glass rod for a few seconds. The time was measured for the gelatine mass to liquefy completely. The reagents require to be highly concentrated for this test and the overall molarities, including the water in the swollen gelatine, were generally between M and 2M. Under these conditions, very highly active hydrogen bond breakers can react in 1-7 min.

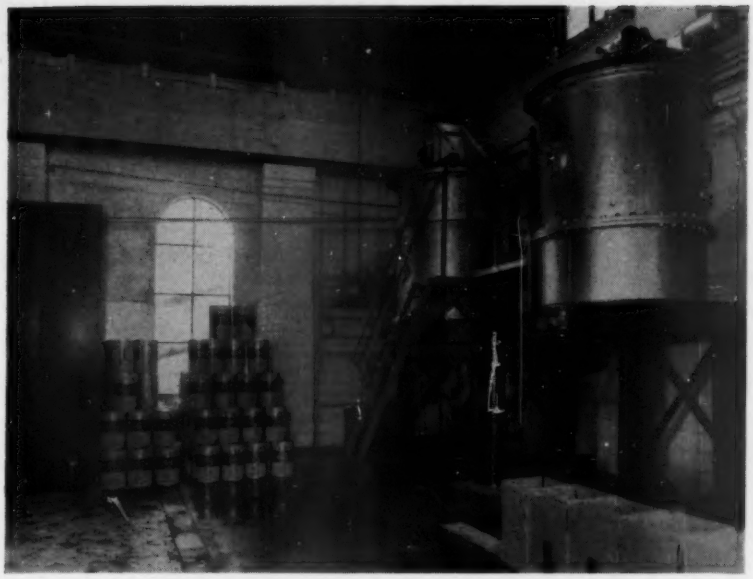
Among the most active of the organic reagents are the sodium salts of many of the aromatic sulphonic acids, toluic acids, benzoic acid and *p*-aminosalicylic acid; thiourea and aniline hydrochloride. With inorganic salts, an active list would include potassium and sodium iodides, lithium bromide, potassium and ammonium thiocyanates, zinc and ferric chlorides and sodium perchlorate.

The breaking and re-forming of hydrogen bonds in a gel is a reversible phenomenon. Always provided that bacteria are excluded and that excessive temperatures are not used, a neutral jelly may be melted and reset without impairing its jelly strength. In the same way, the removal of hydrogen bond breaking reagents from a liquid glue by dialysis, for example, returns the glue to its original jelly strength.

Industrial applications

It is interesting that one of the earliest detailed researches into gel liquefiers was in an attempt to find a viscous, yet free-running, material as a substitute for mineral motor oil. Certainly the widest industrial application of these reagents today is in liquid glue manufacture, where the principal gel depressant is phenol. The do-it-yourself market finds it particularly convenient to take a

* The British Gelatine and Glue Research Association, 2a Dalmeny Avenue, London, N.7.



The concentrated glue is pumped over directly from the evaporators into these mixing tanks, at which stage the gel depressants are added. (This photograph was kindly supplied by Sheppy Glue and Chemical Works Ltd.)

glue directly from a tube rather than from a hot glue-pot, and so does a joiner working on an exterior site. In fact, the furniture industry probably absorbs the bulk of the low melting point animal glues. These glues are used in wooden carcass construction, that is in the outer shell structures of wardrobes and dressing tables. They also find application in dowelling and dovetailing. An especially useful application of the phenolic liquid glue is in cold rubbing joints.

It has been shown in these laboratories that a glue containing a gel depressant can give a stable joint much more quickly than the same glue without the reagent, although the ultimate joint strength will be the same in both cases.

Although there appear to be a few well-established uses for gel depressants, it seems likely that these reagents could be of value in a number of applications of gelatine and glue where it is required to modify setting behaviour or to dissolve gelatine without heat. For example, in the well-known photographic reproduction processes, a gelatine film containing bichromate becomes insolubilised in the exposed regions by the action of light. The unexposed gelatine can be removed, with certain advantages, by the action of hydrogen bond breakers rather than by dissolving it in hot water.

Hydrogen bond breakers have also proved of considerable value as a research tool, in particular for telling us something about the structure of collagen. This protein is an important constituent of the organic matter of our bodies. It is clear that the stability of collagen is partly organised by regions of strong hydrogen bonding. This has been shown by first destroying those chemical bonds which link the collagen into a network. They are unstable in cold alkalies and can be broken by the same processes which are used in the early stages of gelatine manufacture. If now, instead of heating this pretreated collagen, the material is soaked in cold hydrogen bond breakers, the collagen goes through a transition from solid into gelatine solution. On removing the hydrogen bond breakers from this gelatine solution, a jelly is obtained with properties which are identical to the gelatine obtained by conventional heating.

The uses of hydrogen bond breakers in the gelatine field are, as yet, relatively limited, but they are very interesting groups of compounds and are, in the author's opinion, open to fuller exploitation in both pure research and in industry.

FLUORESCING SHAMPOO

In Swiss Pat. 326,772, shampoos are described which contain 10 to 35% of at least one water-soluble anionic synthetic organic sulphated or sulphonated detergent, preferably a higher fatty acid monoglyceride sulphate or a higher alkylsulphate, and 0·1 to 1% of a substantially colourless hair-substantive organic fluorescent coumarin derivative, preferably N:N-di-lower-alkylated 4 - methyl - 7 - aminocoumarin, particularly 4-methyl-7-diethylaminocoumarin, in an aqueous medium, preferably an aqueous alcoholic solution with a *p*H of 4·5 to 6·5. The composition may alternatively be, *e.g.*, in the form of a cream. Example: A clear homogeneous liquid shampoo consists of 21% of the ammonium salt of the sulphated monoglyceride of coconut fatty acids, 0·2% of 4-methyl-7-diethylaminocoumarin, 9·3% of ethanol, 0·4% of perfume, and water q.s. The *p*H is adjusted to about 6·2. The product has a high lathering and cleansing power and gives the hair a greater lustre than other shampoos due to the fluorescent agent which is well absorbed upon the hair.

ANALYSIS OF PHENOLS

The identification and determination of phenols was discussed by Dr. L. Barker, of Leeds University, at a meeting of the Midlands Section of the Society for Analytical Chemistry.

Determinations were made of a number of monohydric and dihydric phenols present together in aqueous solution, the source of the material being gas works ammoniacal liquor. For normal analytical requirements only the total amounts of these phenols were determined, either by halogenation or colorimetric reactions. More detailed analyses have now been achieved by chromatographic and spectrophotometric procedures. Preliminary investigations were made by solvent extraction and distillation. Distillation fractions were analysed using infra-red spectrophotometry for monohydric phenols, and paper chromatography for identification of dihydric phenols, with column liquid partition chromatography for their quantitative determination.

Subsequently it has been found possible to make a relatively rapid and sufficiently detailed analysis of the phenols present in liquors solely by column chromatography and ultra-violet spectrophotometry.

MEMOIRS OF AN INDUSTRIAL CHEMIST

By M. L. Burstall, D.PHIL.

1. How to Make Research Pay

Articles about the strategy and conduct of industrial research are usually written by top people. For a change we present here the first of a short series giving the opinions of a chemist at the laboratory bench—a worm's-eye view of research. What should be its function and how should it be conducted? Should its direction be left in the hands of specialists? What kind of person makes a good research manager? When should a research project be scrapped? These are some of the questions that Dr. Burstall examines. His views are individualistic, provocative and stimulating. Our columns are open to readers who want to express their own views.

IT IS almost impossible nowadays to open any journal which considers itself to be up to date without encountering an article about the problems of research in industry. Whatever the virtues of these pieces they have one general shortcoming: they are always written by people who, as research directors, managers or consultants, have been removed from the personal conduct of research for many years. It is, however, axiomatic among those at the bench that those at the top can have only a hazy idea of what is going on several managerial levels below them. For this reason such articles present a picture of research in industry which is more attractive, more optimistic, and more coherent than the reality. I think it might therefore be salutary to offer a worm's-eye view of the nature and conduct of research in the chemical industry, based both on my own experiences as an ordinary research chemist and on those of friends of mine in similar positions. My aim in so doing is not to deride or to expose to ridicule, but to draw attention to the supreme necessity for clear thinking about the *function* of research.

AIMS AND OBJECTS

What should be the function of research in a company? A company exists to make profits for its owners. The function of those engaged in research is therefore to conceive of and to introduce innovations into the company's operations which will increase these profits either now or in the future. Put in this way it is obvious that all who contribute to such a process, the job-study engineer and the market research analyst just as much as the more traditional white-coated laboratory worker, are engaged in research and should be thought of as forming a single group. The profitable use of the talents of these people requires that correct and explicit answers be given to two connected questions: What sort of research should the company be doing? How should that research be carried out?

What sort of research?

What sort of research should a company do? The manufacture of anything involves four stages: invention, development, production and sale, each of which requires research. In any one field of manufacture, however, one or two of these stages will be more crucial than the others and should therefore have a larger proportion of the research effort. Thus in the manufacture of antibiotics, a field in which profit margins are agreeably high and marketing is comparatively simple, but in which the products become obsolescent fairly rapidly, the discovery of new antibiotics is of prime importance. In the heavy chemical industry, on the other hand, where the product sells itself on price more than anything else, process development should be the most vital type of research. Yet, again, in the retail chemists field, in which a product based on a radically new discovery is extremely unlikely, and in which competition is intense and profit margins small, problems of production and advertising are of the greatest importance. Thus an efficient company should concentrate the largest part of its research effort on that area of its operations which is most important to it, while, of course, it should not neglect those other less immediately important areas.

These points no doubt seem excessively obvious. Let me therefore quote a few of the experiences of friends of mine:

Item: A large company whose interests had previously lain in the heavy chemical field had developed a new and in some ways unique retail product which it was desired to market in a test area. The committee which arranged the test was composed of chemists, engineers and accountants. In a rapid and perfunctory way they decided on a completely atypical test area, appropriated a ludicrously small amount of money for promotion and then, in order to make this sum go as far as possible, they selected the cheapest possible advertising media. To their surprise, if to no one else's, the test was a complete failure.

Item: A very efficient and enlightened company decided to expand its speculative research department. Because of certain current problems it decided to recruit one special type of chemist. Having got hold of several of this type after a

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Dr. M. L. Burstall was born in 1930. He was educated at the University of Oxford, from which he received his D.Phil. in 1959 for a thesis on attempts to synthesise the tetracycline antibiotics. He subsequently spent two years in industrial research in the North of England and one year in the United States, his work being in the fields of bleaching and textile chemistry. He is at present a Research Fellow at University College, London.

good deal of bother and expense, it realised that its long term research interests really lay in another quite different field. This view was shared by most of the newly recruited specialists, who therefore left.

Item: A company which had a good name for the quality of its chemical research was faced with a mixing problem in making a certain product. A machine for mixing separate constituents continuously—which, it might be added, has given excellent results in other hands—was obtained at some cost, and handed straight over to the production department for testing. During the initial trials of the machine a maladjustment caused it to spray the charge-hand with the product. Not unnaturally he reported adversely on the machine, which was thereupon immediately banished to the back of the stores without any further development of it being attempted, and batch-wise mixing was resumed.

Incidents of this sort—and I have no doubt the reader will be able to recall some from his own experiences—are the result of incorrect decisions about the sort of research that is required in a given situation. Why are these errors made? Sometimes they are the result of circumstance: they are made because a company is moving into a field of which it has no previous experience, or because a decision has to be made in a limited time on inevitably inadequate data. Very often, however, they are made because those responsible have underlying assumptions about the scope and nature of research which are not in fact correct, but in which they believe very strongly.

These beliefs are usually implicit rather than explicit, and so are peculiarly immune to change through rational processes. A most important and conspicuous example is the belief of the large majority of those industrial research workers engaged in investigations in the exact sciences that their kind of work is more worthwhile not only to themselves but, by an easy and fallacious analogy, to their employers, than is that of people trained in other disciplines. Indeed, many believers in this notion are inclined to deny all validity to research conducted by methods other than those used in the exact sciences; since such methods are inevitable in all varieties of research involving the behaviour of people—market research and personnel research are examples of

" . . . He reported adversely on the machine . . . "

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obvious commercial importance—such research is immediately damned as unscientific.

Anyone who doubts the truth of these statements should listen to, say, chemists discussing the work of psychologists; I am willing to guarantee that this experience will not only prove my point but will also destroy any belief that a training in the exact sciences confers a general ability to think clearly and impartially. Of course a belief in the superiority of one's own kind of work is very common in all kinds of people—from my own observations it is found to a very marked extent in production managers and retail salesmen—but it is more dangerous in research workers than in others because the esoteric nature, to the lay eye, of their work means that to an exceptionally large extent the direction of their work is determined by their own advice. It is a bold managing director who tells his research department what to work on without first taking its advice.

In the past the major problems of the chemical industry have been those of production and, to a lesser extent, invention, and as a result the research departments of most firms are staffed largely by chemists and engineers, and these people have, because of their own vested interest and because of their narrow vision—and if there is one person narrower than the average chemist it is the average engineer—a powerful incentive to keep the research programme running along the same old familiar lines, regardless of the company's real needs. Competition usually supplies the necessary corrective to such temptations, but in companies which lead, as do many British companies, a commercially sheltered existence, and in which the whims and fancies of the research staff may therefore go unchecked for long periods, the resulting distortions of the research effort may achieve impressive proportions.

" Fashionable " research

Some of these happy firms go all out for pure research: the emphasis is on publications in the learned journals, the acquisition of experts in the most fashionable and esoteric branches of science and of the usually very costly equipment required for their work, and the cultivation of a " university " atmosphere. Others go all out for developing their plant: the maximum degree of automation is installed; plant managers are encouraged to have hobbies which take the form of ordering peculiar and expensive equipment for their own plant; follies, such as plants made entirely out of unusual materials, are constructed.

These activities are often accompanied by a trend toward bureaucracy and the creation of vast managerial hierarchies whose purpose seems to the untutored eye to be the reduction of the ratio of productive to unproductive staff to the absolute minimum. Of course, all these projects are justifiable and even beneficial in themselves, but that they should be exceptionally prominent is, alas, only too often a sign that some other less showy but equally vital aspects of research are being neglected. Equally obviously the cases I have indicated are extreme cases, but they illustrate in a rather striking way the tendency of scientists to favour their special interests. For this reason I am dubious about the current propaganda in favour of having more scientists in high positions.

On tap, not on top

Many rather cheap remarks have been made about the supposed idiocy of someone who said that the place of the expert is on tap, not on top: he was in fact stating the simple truth in that no one who is a success at the top can afford to remain an expert, with all the personal prejudices and inclinations that that status implies. By all means let companies recruit their top management from among their research workers, but let them do so because there are individual people with the necessary talents in their research departments and not because of

some mistaken idea that research workers are as a class magically endowed with all abilities. Research workers who suffer from an itch for power might themselves remember that if they are going to become successful executives they will have to stop identifying themselves with the boys in the back room; I have met very few really good research workers who can take this painful step. Coming from a professional research chemist these remarks may sound like sedition. I make no apology. The direction of research is too important to be left in the hands of specialists.

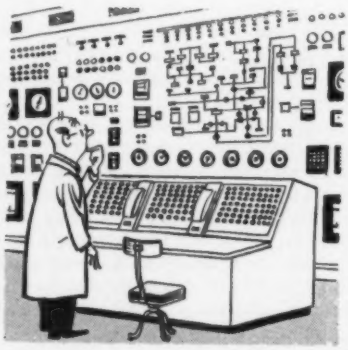
Let me recapitulate: the purpose of industrial research is to make money; companies should therefore put money into those of their activities in which research will bring the highest financial return; in attempting to identify these areas they should beware of the vested interests of their research establishments.

CONDUCT OF RESEARCH

Let us now consider the conduct of research from a similar point of view. I shall confine my remarks to the conduct of laboratory research, but many of them apply *mutatis mutandis* to all other kinds of research as well. The great aim in all research, so rarely kept in mind, is to solve any given problem with the minimum effort necessary. How is this to be done? The first step in approaching a new problem is to decide very carefully which questions need to be answered and how precise the answers need to be. In my own experience not nearly enough time or thought is given to this point with the result that all too often a research worker will spend a great deal of both in answering the wrong questions or in answering the right questions with an altogether unnecessary degree of accuracy. Since most scientists are trained to admire accuracy for its own sake this last error is especially common.

Meaningless memoranda

Before any serious investigations of a problem are undertaken it is absolutely essential that a *detailed* and *precise* analysis of the problem and of any projected investigation of it be submitted to and discussed thoroughly with all responsible superiors. Once such a study is approved any necessary research should be carried out by the research worker without further intervention by his superiors except in the most exceptional circumstances. I might add a word of warning. In many companies the responsibility of deciding on the most suitable approach to a problem is discharged by the research worker—often in collaboration with his immediate superior—writing a brief memorandum on the subject for the benefit of higher authority. Having written quite a few of these myself I feel compelled to point out for the benefit of any innocent directors who may be reading this article that such memoranda are often highly misleading. Many chemists are adept



". . . the maximum degree of automation is installed . . . "

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at writing them in such a way that they will be left free to work on only those aspects of the problem which interest them personally, and many section leaders, in order to spare their superiors the necessity of making a serious effort to understand the issues involved, have the pernicious habit of sub-editing these memoranda so as to make them as short and as vague as possible. The end-product of such efforts frequently verges on the meaningless. Any research director who has the interests of his company at heart should call for really detailed preliminary studies and should submit them to the most extensive and merciless scrutiny.

"The literature is rubbish"

In the course of making these preliminary studies it is desirable that a serious effort be made to find out what is known already about the problem. An obvious step? Far from it. One of the most disheartening things about industrial research is the tacit refusal of many industrial research workers to read the literature. Many in fact, especially among those who have been away from universities for any length of time, read nothing but their departments' own reports except when subjected to the most extreme pressure. The consequences of this attitude are often highly amusing. In one case known to the author some very gifted chemists spent a good deal of time studying the behaviour of a certain compound in solution in apparent ignorance of a previous—and, it might be added, much more accurate—investigation, the results of which had been published many years before in one of the most accessible of the learned journals.

Of course rationalisations for not reading the literature abound. I once met a man who told me that the literature was all rubbish anyway and that he personally had got on very well without reading it. Few, however, have the nerve to take this line. The more usual approach is to suggest that the literature on a given subject is too extensive to be read; this frequently means that the speaker is too lazy or too slow a reader to attempt the task. In point of fact the ability to make a rapid search of the pertinent literature is essential to any scientist, and it is surprising that people who have been through a university should not have acquired it.*

It is also desirable at this stage that some serious thought be given to the choice of the methods to be used in the investigation. Frequently the methods to be used are obvious from the nature of the problem and any question of choice may be settled by the relative convenience of the methods. One general observation is appropriate, however: it has often struck me that physical scientists, unlike biological or social scientists, are, because of the sort of training they receive, unaware that many problems may be solved quite adequately by the use of other than exact methods.

Subjective investigations

A case in point is the investigation of the factors influencing the subjective properties of a material, such as its taste, feel or smell. The literature abounds in accounts of such investigations in which so-called "objective" methods were used.

* A fellow graduate of the University of Oxford, in which this point is constantly emphasised, has suggested with some reason that graduates of other, younger Universities are not so well trained in this respect.

The general idea behind such methods is to establish a correlation between variations in the subjective property under examination and variations in some measurable objective property of the material; measurement of the latter will then provide a measure of the former. This approach is in principle an excellent one; it also has an incidental appeal to physical scientists in that it allows them to give full rein to such gadget-building talents as they may possess and it enables them to get the sort of results that they can understand. However a glance at the literature will show that in practice the necessary correlation between the objective and the subjective properties is more often than not quite inadequately established; the cynical may suspect that sometimes a correlation does not really exist. If this is so then the results given by the method will be meaningless. In practice the simplest, most rapid and most foolproof method of investigating problems of this type is by using the subjective property as the basis of reference in the method of paired comparisons so familiar to psychologists. This seems a pretty obvious idea, yet how often this and other similar approaches are overlooked by those obsessed with the search for an exact "scientific" method. I would advocate most strongly that all new recruits whose training has been in the physical sciences be given an intensive course in the design of experiments and the use of statistics before they are turned loose in the laboratory.

Superfluous supervision

I would now like to make a few remarks about the role of the supervisory ranks—research managers, group leaders and so on—in industrial research. The first difference that most new recruits to industry notice between academic and industrial research is that whereas in the former a supervisor may have ten, fifteen or even more pupils to look after, his industrial counterpart will never have more than five or six subordinates and will often have fewer—and this despite the larger amount of supervision required by research students and the much more vigorous and active life that a university don leads. I am convinced that this difference can be neither excused nor justified.

The plain fact is that a lot of the supervisors found in the average industrial laboratory are superfluous.

"... pestering one's subordinates with incessant visits ..."

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After all the function of a supervisor is twofold: he must ensure that his subordinates do their job efficiently and he must act as the main channel of communication between his group and other departments and levels of authority. I have already pointed out that the only time that a supervisor should be intimately involved with a problem is at the planning stage; after that the research worker should be left alone, subject to his making satisfactory progress reports, until the investigation is concluded. It is obvious that a supervisor who adopts this attitude and who confines his liaison duties to the necessary minimum can supervise quite a number of people if supervision is to be his full-time job. Indeed, for small groups of, say, less than five research workers there is no need for a full-time supervisor; his responsibilities can be discharged by one of the group, appointed from above on a temporary basis or selected by the group itself. The larger group, or the group of groups, requires, however, a full-time manager. The selection of the right person for such a job can inhibit the growth of the bureaucracy that is so frequent and undesirable a feature of industrial research.

Clever, self-confident, lazy ...

In my opinion the right sort of people are clever, self-confident and rather lazy. Let me enlarge on this. Scientists being what they are, it is necessary to have over them someone who knows the field of their work thoroughly and who has a quick analytic mind: no one else will be respected, and a manager who is not respected is useless. He must be self-confident—and able to impress others as being so—or he will be pushed around by his superiors and his subordinates, in which case no one will trust him.

Lastly he should be rather lazy. By this I do not mean that he should resemble that rather common type of middle-rank manager who spends the day sitting gloomily in his office contemplating the distant prospect of his pension, but that he should be entirely free from a neurotic compulsion to work. This latter malady is unhappily common in industry, especially among administrators, and is the biggest single cause of bureaucracy. The sufferer, realising that the discharge of his proper duties will not fill the hours from nine till five and will—dread thought—leave his evenings free, immediately devises new and unnecessary chores for himself in order to convince himself of his own indispensability. In research managers this may take the form of immersing oneself in administrative routine, or of pestering one's subordinates with incessant visits, telephone calls and demands for reports of progress, or of obsessively rewriting and sub-editing reports and letters, or, most commonly of all, of worrying vaguely about everything. It need hardly be pointed out that not only is this sort of thing utterly unproductive but it has a very demoralising effect on subordinates. A research manager should delegate every possible administrative job and concentrate on his proper function which is to control research; if he then has the leisure for one-hour coffee breaks that is his good luck—and a tribute to his own ability.

Ending a project

Lastly let us consider the problem of terminating a research project. As far as possible this should be done at some logical point in the programme; however it sometimes happens that this condition cannot be satisfied because of the appearance of more urgent problems. If the latter is the case then the research manager faces an interesting test of his managerial ability, since no good research worker will ever willingly agree to the termination of his own project under any circumstances and a sudden arbitrary termination usually produces a violent response. If the manager is convinced of the necessity of this step—and it is his duty to demand the most extensive proofs of its necessity—then there

(*Continued on page 77*)

COSMETICS and Toilet Preparations

By Wm. W. Myddleton, D.SC.

Mechanism of the skin ● Moisture retention ● The 'natural moisturising factor' ● Biogenic stimulants ● Tissue extracts

Healthy skin

COSMETIC science can produce very elegant products at the present time to fulfil many different functions extremely effectively, but one of the paramount objectives of the science has not yet been successfully achieved. This major objective is the maintenance of the human skin in a healthy supple condition through all the adverse circumstances encountered throughout life—adverse climatic conditions, damaging conditions brought about by contacts with extractives and detergents and, obviously, the ravages of time.

This is not meant to imply that nothing has been achieved in this direction. The direct implication is that we do not adequately understand the mechanisms at work in the normal living skin by which it is enabled to carry on its normal functions. When disorganisation of the mechanism occurs we are not fully equipped with information to prescribe the appropriate remedial cosmetic formulations to deal with the breakdown.

It is strongly held by some that such remedial action is no concern of the cosmetic chemist and that his legitimate sphere lies in ministering to the normal skin, protecting it against the adverse conditions from which it might suffer damage. The wrinkling, drying and loss of elasticity and tone of the skin as the human subject advances in years betoken in reality a form of breakdown in the skin mechanism which in most cases is unaccompanied by manifestations of a pathological condition calling for specialised medical care and attention.

Fundamental knowledge concerning the skin and its activities is gradually being brought to light and made available to the cosmetic chemist through the work of biochemists, physiologists, dermatologists and others, and there is every indication that we are experiencing a period of accelerated development in cosmetic science as a consequence.

The American Society of Cosmetic Chemists has recently honoured and paid tribute to the great contributions to our fundamental knowledge of the skin made in recent years by Dr. Irvin H. Blank, a biochemist of Harvard University, by naming him as the recipient of the Society's Special Award, carrying a prize of $1,000.[1]

Moisture

Dr. Blank was one of the first to produce scientific evidence that a healthy skin is a moist skin and that the outer horny layer, when it has been dried out, cannot be softened either by oil or humectants. He showed that the important factor in the retention of moisture in the skin is the presence of a hydrophilic material in the inner regions of the *stratum corneum* acting there as a barrier against the free passage of water from the deeper layers through the cornified epithelium. The hygroscopic material was extracted from the skin by washing the surface with an organic solvent and then, after removal of the lipids, the application of water served to bring out the water-soluble material. The loss of moisture from the skin is regarded as resulting from differences between the moisture content of the skin and the relative humidity of the surrounding atmosphere.

Other workers have been engaged upon similar investigations and agree upon these conclusions. The consensus of opinion is that the *stratum corneum* is composed of keratin, lipids, water-soluble hydrophilic material, water, and a "cementing" material which binds the cornified cells together and to the underlying layers. The "cementing" material plays a part along with the hygroscopic water-soluble material in the phenomena of "chapping." Loss of the hygroscopic material leads to drying out of the horny epidermis, and if the "cementing" matrix does not disperse the cornified cells are not allowed to disengage and fall away when they have served their purpose and so a thickening occurs and dryness leads to cracking.

The dispersal of the "cementing" material in calloused skin has been investigated by Flesch,[2] who describes the process as keratolysis in the dermatological sense as distinct from the chemical sense, which implies a partial or complete solubilisation of keratin. The keratolysis brought about by dispersal of the "cementing" matrix was shown to be assisted by the application of urea and allantoin, the former at an undesirable level of concentration, the latter at a satisfactorily low concentration.

The water-retaining substance has been the subject of further research and the general opinion is that it contains a number of different compounds including up to 40% free amino acids, 16 in number, a smaller amount of urea, lactates, a number of metallic salts and other unknown compounds. Horny tissue from which these substances have been extracted becomes water repellent, but the *stratum corneum* so extracted allows of the passage outwards of water vapour from the underlying tissue almost three times faster than before extraction.[3]

Thus the hypothesis that moisture retention of the skin is controlled by the presence of hygroscopic

material in the *stratum corneum* has been subjected to crucial tests and reasonably well confirmed. Analyses have shown that the skins of many mammals contain similar substances and that the human skin contains less urea. Hair and wool contain a similar hygroscopic material,[4] and it has been suggested that its presence in the hair may have significance in maintaining it in good condition, so that shampooing may have a deleterious action in stripping it completely away.[5] An interesting investigation based upon a radiochemical technique showed that amino acids, the major constituents of the hygroscopic material, can be deposited upon the hair and presumably also upon the scalp from a shampoo in which they are incorporated. Adjustment of the concentration of amino acids in the shampoo can thus be made to ensure that they are not completely stripped from the hair in the process.

These investigations present us with a confirmed hypothesis in the testing of which observations were reduced to numerical values.

"Moisturising factor"

The hypothesis that the so-called "natural moisturising factor" can be extracted from a skin and then applied externally to the intact human skin in which there is a deficiency, to restore its moisture-retaining qualities, is of quite a different order. There are no definitely satisfactory methods for measuring changes in the intact human skin, changes of moisture content, flexibility, wrinkling and so on. Observations based upon visual inspection and manipulative methods are notoriously unreliable and in addition most of the reports on the subject leave a feeling of dissatisfaction with the nature of the controls used. It is likely that any reasonably formulated cosmetic product will bring about some sort of improvement in, say, an ageing skin, but on the evidence provided it would be almost impossible to state definitely that of two such products producing some sign of improvement one was more effective than another.

Biogenic stimulants

In recent years there has grown up in Western Europe a practice of tissue therapy applied to cosmetics. The claim has been made that extracts prepared from tissues which have been treated in a special way and extracted by suitable processes, possess remarkable powers of toning up relaxed skin and rejuvenating ageing skin tissues when applied externally to human subjects.

It is widely admitted that inspiration for this development came from the work of V. P. Filatov and his collaborators in Russia. A surprising divergence in approach to the subject and in the method of tackling the problems arising has shown itself in the later procedures. Filatov placed living plants under marginal survival conditions at a temperature from 2° to 4°C. for 15 days in the dark. Extraction of the leaves of the plant with ether led to the isolation of a mixture of substances which acted as stimulants to the growth and respiration of yeast cells and the growth of pea seedlings. He reported that the healing of wounds in the rabbit was hastened by application of the extracted material.[6]

In a search for the mechanism of this stimulation Filatov found that the active extracts contained cinnamic and hydroxycinnamic acids, and Filatov postulated that these substances are produced in the living cell under adverse conditions and have the effect of fortifying the cell in its struggle for survival. They were assumed to have originated in the hydrolysis of glucosides or from tyrosine and phenyl alanine and to owe their stimulating effect to an influence upon the oxidation-reduction processes of the plant or animal tissues to which the extracts were applied, including those of man. They can act as hydrogen-acceptors and become converted into hydrocinnamic acid and hydrocoumarin derivatives.

Filatov submitted his hypothesis to the crucial test by investigating the effect of low dilutions of cinnamic acid, its sodium salt, coumarin and the sodium salt of coumaric acid upon the growth of yeast cells and sprouting seedlings. Each of these substances measurably stimulated growth just as did the extract of leaves of the aloe which had been kept under adverse conditions for several days.

Other workers in France and Germany proceeded to modify the extraction procedure so as to preserve as far as possible unstable substances such as enzymes which were substantially destroyed by the original extraction procedure. The range of tissues submitted to extraction was extended and particular stress was laid upon animal tissues closely concerned with active cell proliferation as, for example, the mammalian, including human placenta and various parts of the embryo, other than human.

Very definite effects in the rejuvenation and general toning of human skin by external application of these biological extracts have been claimed, and in spite of the extraordinary difficulty of making observations on changes in the condition of human living skin with the means at present available to us results are stated to show that the activity of one extract can be compared with the activity of another. The degree of precision inferred here, in order to prove acceptable, would require much greater detail than is given of the control tests applied and a fuller description of the condition of the subjects before and after application of the preparations.

Evidence of the accelerated healing of wounds, whether in rabbits or in human subjects, is of little value because after an initial period of apparent inactivity healing becomes so rapid that distinctions cannot be made between one treatment and another. It has not yet been found possible to reduce the initial period of inactivity by any specific treatment. The contents of the living cell, particularly of the cell which has survived in adverse conditions, are now apparently considered to produce an extract endowed with the attributes of a saintly relic. The simplest living cell is of such amazing complexity that it is impossible to list the range of chemical substances contained within it in normal life or after survival in adversity.

It is certain that many of the substances present in the living cell can interact with each other if the structure of the cell is damaged and they are released from restraining boundaries which exist within the cell. The substances present in the extracts from disintegrated cells must therefore differ substantially from the contents of the living cell.

The hypothesis that chemical substances within the cell can be extracted and made to enter other living cells by external application to tissues like the skin, there to take up their original function, is rather like the hypothesis that the emotions aroused by listening to a moving symphony can be paralleled by extracting every note from the musical composition and then releasing them all simultaneously in a disorganised synthesis of sound.

Most of the analytical work on the tissue extracts has been directed towards the provision of control tests to guarantee by reproducible results the uniformity of the product. Several biological and chemical tests have been described, but there is none generally acceptable as a working standard. Tests which have been proposed and used include:

Biological Tests

1. The effect of the extracts on the germination and rate of growth of seeds of garden cress and lentils and on the growth of yeast cells and various micro-organisms.
2. Effect upon the contraction of frog leg muscle in Ringer solution under intermittent electrical stimulus. (Effect on fatigue.)

Chemical Tests

3. Effect upon the oxidation-reduction processes of living cells.
4. Estimation of phosphatases.
5. Exploration by paper chromatography of the amino acids in the extracts before and after hydrolysis. (Amino acids and polypeptides.)
6. Determination of the ratio sodium : potassium. A high proportion of potassium is indicative of a more complete disruption of the cells.

There is evidence here that the primary objective is to extract and preserve the entire contents of the cells.

The choice of tests as a means of controlling production of the extracts varies from group to group of workers and followers of tissue therapy. A number of the tests enumerated here have been described as useless[7] either because of various weaknesses in the particular test which make it impossible to obtain concordant results or, as in the case of the first test in the list, because the evidence relating to the growth of cellulose structures cannot be applied to protein formations.

It is quite clear that the tissue extracts contain many different unknown substances, any of which could be regarded as playing a part in the effects claimed for tissue extracts. The host of substances can be likened to the numerous gods who once walked among men and played an unpredictable and arbitrary part in mundane affairs. A prudent mortal inevitably played safe by propitiating the lot. From time to time he would sacrifice on the altar of any one god according to what he had on his mind and the sphere of influence of the god.

He often showed sufficient cunning to look out for the possibility of invoking what he termed "synergistic action," and if he saw the possibility of doing so he would call to sacrifice at the shrine of another deity on the way home to enlist added support there also. The parallel is rendered more exact by the fact that this "synergistic action" has been brought into the discussion of tissue extracts in recent times.

REFERENCES

1. Presentation of award. *J.S.C.C.*, 1959, **10,** (5), 359.
2. P. Flesch, *Proc. Sci. Sect. T.G.A. U.S.A.*, 1958, June, No. 29.
3. O.K. Jacobi, *ibid.*, May, 1959.
4. A. Bolliger and J. R. Gross, *Austral. J. Science*, 1954, **16,** 190.
5. J. J. Herd and R. H. Marriott, *J.S.C.C.*, 1959, **10,** (4), 272.
6. P. V. Filatov and V. A. Biber, *Doklady Akad. Nauk. U.S.S.R.*, 1948, **62,** 259, through *Amer. Chem. Abs.*
7. E. G. Lapine, *Cosmetologie*, 1959, **15,** 21.

ANTIBIOTICS

By G. Shaw,* A.R.I.C.

Continuous fermentation • Griseofulvin • The Penicillin nucleus

Continuous fermentation

THREE major symposia[1,2,3] on continuous fermentation held in 1958 indicate the growing interest in this field of technology. Yeasts,[1] industrial alcohol,[1] sulphur,[1] acetic acid[4] and wine[5] are produced on the industrial scale by continuous culture. Although continuous fermentations may offer advantages in productivity and cost over conventional batch processes, they could involve severe losses from infections, genetic instability and plant inflexibility. These problems are discussed by Elsworth and his associates,[6] who studied the comparative costs of sorbose manufacture, from sorbitol, by continuous and batch processes. They show that the former gives a greater return on invested capital than does the latter. In another interesting paper, Dindoefer and Humphrey[7] suggest how multi-stage continuous systems can be designed from material balance and kinetic data available from simple batch fermentations. The optimum design is then determined by integrating these data with process costs. As an example of the method, a 24% saving in cost is indicated in the production of bakers' yeast by a two-stage continuous process as an alternative to the optimal batchwise operating conditions.

Of more direct interest to the antibiotic producer is the work of Pirt and Callow[8] on the production of penicillin by continuous fermentation. The studies were carried out in a 2-litre single-stage unit agitated by a turbine impeller. A chemically defined medium containing glucose and inorganic salts was fed continuously through a peristaltic pump, antifoam was added at fixed time intervals through a second peristaltic pump, and fermentation *p*H was controlled continuously by automatic addition of acid or alkali.

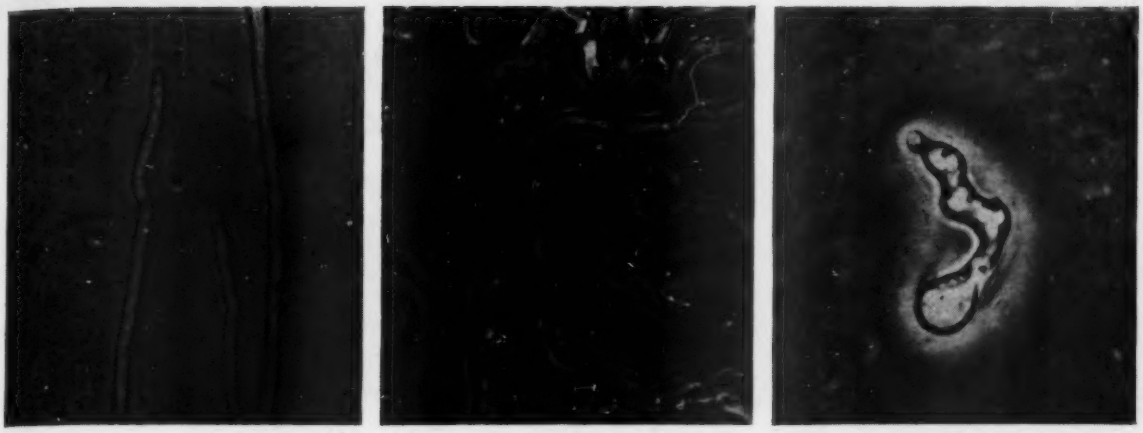
Fermentation runs up to 2,000 hr. in duration in the equipment showed only small losses from infection and no loss in titre potential from genetic variation.

With 2 litres of medium in the fermenter and a feed rate of 100 ml. an hour to give a residence time of 20 hr., it was found after about 40 hr., that the concentration of mycelium reached a constant value that could be maintained for long periods. This concentration was proportional to the sugar content of the feed, 2% of glucose giving about 8 mg./ml. dry weight.

The production of penicillin was proportional to the mycelial concentration, and with a feed containing 4% of glucose a penicillin concentration of 280 units/ml. was obtained over 1,000 hr. of continuous fermentation.

The best *p*H for the production of mycelium was reported to be in the range 7 to 7·4. In a further paper by the same authors[9] the effect of

* Glaxo Laboratories Ltd.



Photomicrographs (×800) showing the growth form of hyphæ of *Microsporum canis*, one of the fungi causing ringworm infections in humans and animals, (*a*) growing on agar containing no griseofulvin, (*b*) growing on agar containing 0·3 part per million griseofulvin and showing the typical "curling" form of growth, (*c*) growing on agar containing 5 parts per million griseofulvin showing stunted growth derived from one spore. All the above cultures have been grown for three days before photographing.

*p*H is examined more thoroughly, and it is shown that in a chemically defined medium continued growth at *p*H above 6 results in the development of an aberrant form of mycelium in which the normal long thin hyphæ are replaced by short swollen cells. The hyphal length is at a minimum at values of *p*H 7 and above. These changes are accompanied by the formation of pellets and are undesirable, because a constant mycelial concentration could not be maintained in continuous culture and the rate of penicillin production by pellets is below that of the filamentous form. On the other hand, the long thin hyphæ increase the viscosity of the broth and make stirring more difficult.

If the ammonium sulphate in the synthetic medium is replaced by corn steep liquor, the aberrant hyphæ are not formed at *p*H 7·4, so that the above observations may not be of much importance in industrial practices.

Pirt and Callow suggest that higher yields of penicillin could be obtained by running a two-stage continuous fermentation. The first stage would be run at *p*H below 7 for production of mould and the second at a higher *p*H for penicillin production.

Griseofulvin—an antifungal antibiotic

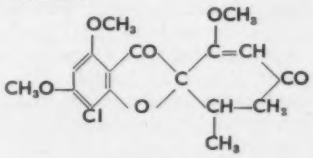
A new approach to the treatment of fungal diseases in human beings, of which ringworm and athlete's foot are common examples in this country, was opened by a report from Williams *et al.*[10] of successful treatment by oral administration of griseofulvin.

This antibiotic, first identified and named by Oxford *et al.*,[11] by whom it had been isolated in 1939 from fermentation cultures of *Penicillium griseofulvum*, was not known to be biologically active until 1946, when Brian *et al.*,[12] observed its effect upon some types of fungi; they noted cessation of growth and deformation of the fungal hyphæ, resulting in a characteristic curled appearance, both in the presence of low concentrations of griseofulvin. Further work revealed that griseofulvin was effective in the control of many plant fungal diseases and led to its use in agriculture.

The possible range of application was widened considerably and significantly with the discovery by Gentles[13] in 1958 that orally administered griseofulvin was effective in the treatment of ringworm in guinea pigs. This was soon confirmed by other workers, on guinea pigs and calves; out of these observations arose the work of Williams *et al.*, and a number of clinical observations by other workers, from which it seems clear that the use of griseofulvin for the treatment of fungal diseases represents a substantial advance in chemotherapy.

A method of manufacture has been described.[14] Prepared by deep fermentation techniques, from a strain of *Penicillium patulum*, griseofulvin crystals are found within the mycelial cells. Roller drying of the fermentation broth results in a light brown powder, rich in griseofulvin, which is suitable for agricultural use. By extraction of this material with suitable solvents, purification to remove fermentation by-products and then crystallisation, a pure pharmaceutical grade of griseofulvin is produced.

Griseofulvin is a white, crystalline, optically active substance, stable at temperatures up to 100°C. and melting at 221°C. It is soluble in acetone, methanol or dimethylformamide but insoluble in water. The structure, which is based on a highly substituted coumaran nucleus, has been elucidated by Grove *et al.*[15] and by MacMillan.[16]



GRISEOFULVIN

Although fungistatic and not fungicidal, griseofulvin is therapeutically effective when used systemically. This is explained by its affinity for keratin, which is the source in mammals of tissue such as skin, hair and nails. Griseofulvin becomes incorporated in these tissues, which thus become resistant to fungal invasion. Clinical progress occurs because outer layers of tissue are gradually shed and the

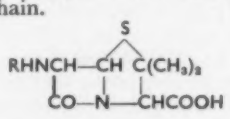
fungal growth moves towards the surface. The effective use of griseofulvin therefore involves preventing the fungus from invading the tissue at a rate greater than the production of new keratin. The failure of griseofulvin by topical application, described by Peterkin,[17] is attributed to its lack of absorption at the skin surface.

Spectacular improvement of keratinous tissue infection has been reported, particularly in dermatophyte ringworm infections; a feature of the trials carried out so far has been the virtual absence of toxic effects from oral administration of the antibiotic.

Although clinical trials continue, even on the evidence at present available it appears justifiable to record that griseofulvin is now established as a valuable addition to the range of antibiotics in human medicine.

The penicillin nucleus—6-amino-penicillanic acid

The presence of 6-amino penicillanic acid in fermentation broth produced by a strain of *Penicillium chrysogenum* has been reported recently by Batchelor *et al.*[18] together with some properties of the pure compound after extraction from the fermentation broth and crystallisation. Using this "penicillin nucleus," these workers have shown that by treatment with an excess of phenylacetyl chloride in the presence of sodium bicarbonate, it is possible to prepare penicillin G and similarly with phenoxyacetyl chloride to prepare penicillin V. The formation of these penicillins by a similar method has been confirmed by Sheehan and Henery-Logan[21] using 6-aminopenicillanic acid obtained by partial or total chemical synthesis. It is apparent that, by analogous methods, it will be possible to synthesise a large number of penicillins differing only in the nature of the side chain.



PENICILLIN

R = H—6-amino penicillanic acid
R = $C_6H_5CH_2CO$—penicillin G
R = $C_6H_5OCH_2CO$—penicillin V
R = $^+NH_3$ $CH.(CH_2)_3CO$—cephalosporin N
COO^-

The presence of 6-aminopenicillanic acid in penicillin fermentation broth has been suspected for some time; in 1953 Kato[19] concluded from indirect evidence that it was formed in fermentation broth containing no added precursor, and the observations of Arnstein and Crawhall[20] in their work on the mechanism of penicillin biosynthesis were consistent with the view that attachment of the side chain to the nucleus is the last step in the process.

Present evidence supports the belief that the penicillin nucleus is bio-synthesised from L-cysteine and from the carbon skeleton, at least, of valine; it is because of differences in the side chain that the various penicillins differ in their biological and chemical properties. Thus penicillin V, with a side chain derived from phenoxy-acetic acid, is more stable to acids than is penicillin G, with a side chain based on phenylacetic acid, and for this reason penicillin V is particularly suitable for oral administration. Cephalosporin N, a penicillin with a highly polar side chain derived from *a*-amino-adipic acid, is more active against some Gram-negative organisms than is penicillin G. It should be noted that 6-aminopenicillanic acid itself is considerably less active biologically than penicillin G.

In the biosynthesis of penicillin it is usual to add the appropriate precursor to the broth during the fermentation cycle; in the production of new penicillins this method is not wholly satisfactory, because of the unpredictable behaviour of fermentations modified by the addition of new compounds, and this may well have restricted research in the past. Thus, the significance of the new method of isolating 6-aminopenicillanic acid is in its use as a starting material for the chemical synthesis of new penicillins, since it offers a more versatile route than has hitherto been possible.

Already, a new penicillin—*a*-phenoxypropionamido penicillin—has been made available to the medical profession. In a recent publication[22] it is reported that oral administration of the new penicillin results in a blood serum level which is twice that obtained by oral administration of an equal amount of penicillin V and similar to that obtained by intramuscular injection of an equal amount of penicillin G.

REFERENCES

1. "Continuous Culture of Organisms. A Symposium." Czechoslovak Acadamy of Sciences. Prague, 1958.
2. "Recent Progress in Microbiology." Blackwell. Oxford, 1959.
3. Abstr. 134th Meeting Amer. Chem. Soc., Chicago. Sept. 1958.
4. P. Gerhardt and M. C. Bartlett, *Advances in Appl. Microbiol.*, 1959, **1**, 215.
5. J. L. Riddell and M. S. Nury, paper read at 14th General Meeting of the Society of Industrial Microbiologists, Palo Alto, Calif., 1957.
6. R. Elsworth, R. C. Telling and D. N. East, *J. Appl. Bact.*, 1959, **22**, 138.
7. F. H. Deindoefer and A. E. Humphrey, *Ind. Eng. Chem.*, 1959, **51**, 809.
8. S. J. Pirt and D. S. Callow, paper read at a joint meeting of the Society of Chemical Industry and the Society of Applied Bacteriology, London, Jan. 1959.
9. S. J. Pirt and D. S. Callow, *Nature*, 1959, **184**, 307.
10. D. I. Williams, R. H. Martin and I. Sarkany, *Lancet*, 1958, (7058), 1212.
11. A. E. Oxford, H. Raistrick and P. Simonart, *Biochem. J.*, 1939, **33**, 240.
12. P. W. Brian. P. J. Curtis and H. G. Hemming, *Trans. Brit. Myc. Soc.*, 1946 **29**, 173.
13. J. C. Gentles, *Nature*, 1958, **182**, 476.
14. B.P. 795,039, May 14, 1958. A. Rhodes and D. L. Fletcher (to Glaxo Laboratories Ltd.).
15. J. F. Grove, J. MacMillan, T. P. C. Mulholland and M. A. T. Rogers, *J. Chem. Soc.*, 1952, 3977.
16. J. MacMillan, *ibid.*, 1959, 1823.
17. G. A. G. Peterkin, *Practitioner*, 1958, **180**, 543.
18. F. R. Batchelor, F. P. Doyle, J. H. C. Nayler and G. N. Robinson, *Nature*, 1959, **183**, 257.
19. K. Kato, *J. Antibiot*, Japan, 1953, (A), **6**, 130, 184.
20. H. R. V. Arnstein and J. C. Crawhall, *Biochem. J.*, 1957, **67**, 180.
21. J. C. Sheehan and K. R. Henery-Logan, *J. Amer. Chem. Soc.*, 1959, **81**, 5838.
22. E. T. Knudsen and G. N. Rolinson, *Lancet*, 1959, (7112), 1105.

FLOWER-BASED SUNBURN CREAM

Skin-treating compositions, particularly for preventing or curing sunburn, are prepared by mixing an aqueous extract of marigolds with tincture of benzoin, tincture of myrrh and the usual constituents. Example: An aqueous extract of marigolds is mixed with about 10% of glycerol, 1·5 to 2% of triethanolamine and traces of borax, heated to 70° to 90°C., and emulsified with a melt of stearin and coconut oil, preferably in a ratio of 1:1, and preferably small amounts of beeswax and/or adeps lanæ anhydricum and/or spermaceti; the melt is separately heated to 60° to 80°C. and mixed with traces of thymol. 1 to 1·5% of tincture of benzoin and 0·5 to 1% of tincture of myrrh are added.—*Austrian Pat. Appln.* A.1,162/57.

DISINFECTANTS and Disinfection

By A. H. Walters, F.I.M.L.T., M.R.S.H., M.I.BIOL.

Surgical disinfectant • *Seed-derived antimicrobials* • *Antibacterials in conifers* • *Amino acid inhibition of* Esch. coli. • *Growth of organisms in heavy water* • *Platinum loop sterilisation* • *Fungistats in trees* • *Inhibition of reversory metabolites*

Phisohex and safer surgery

THIS is the rather bold title of a paper contributed to a medical journal by a lecturer in bacteriology, a surgical registrar and an operating theatre sister.[1] Seven references are given, the earliest being dated 1936. The incidence of glove puncture was found to be 30% in over 1,000 gloves, which confirms the observations of many other workers as instanced by the relatively high output of patched gloves from most theatres, often to be used elsewhere in the hospital. Organisms from surgeons' perspiring hands are ducted through the punctured gloves during operations, and these may be a source of contamination giving rise to post-operative sepsis. Apparently a 30% glove puncture rate was accepted by the authors as an inevitable surgical hazard. Thus, since in this case a surgical glove only stands roughly two chances in three of being an effective insulating agent for the hands, efforts were directed at keeping the skin of the hands sterile during the course of an operation. No controls were instituted whereby surgeons subjected their hands to the sterilising treatment and then operated on an equal number of cases with (taking care to avoid puncture) and without gloves and observing the post-operative sepsis rates. From the strictly scientific view it is thus difficult to see the precise point in the experiment lest it be to demonstrate, as distinct from proving, that a certain hand disinfection method is good at making surgery safer, because surgeons puncture their gloves often and render them useless.

The subjects scrubbed their hands for set times, first using soap, donned gloves and performed an operation, after which finger-pad cultures were taken which naturally proved positive. Then *Phisohex* was substituted for soap, following which similar tactile plate cultures proved practically negative. (Phisohex is a soapless detergent cream with 3% hexachlorophene, *p*H 5·5.) A laboratory test on agar plates showed no inhibition to staphylococci by Phisohex when agar was used with Tween 80 as an inactivator. The tactile cultures in the test were mainly on Tween 80 agar.

The authors concluded that the use of Phisohex produced a highly significant fall in the number of colonies of skin organisms grown from the finger pads at the end of operations, but they observed no difference in post-operation sepsis rates. These conclusions are in direct contrast with the findings of the workers at the Robert Koch Institute, who state that the protective film attributed to Phisohex is illusory, since it merely prevents wetting of the skin.[2]

Antimicrobials from seeds

Many of the higher plants have been examined for antimicrobial activity, and in this connection leaves, stems, roots, barks, flowers and fruits, but only occasionally seeds, have been investigated. A paper[3] has now appeared which is concerned with extracting antimicrobial substances from seeds of dry origin. The test organisms were a selection of 13 common Gram-positive and Gram-negative organisms and seven fungi. All the bacteria were cultured on bouillon and the fungi on Sabouraud's dextrose broth and agar. The seed extracts were prepared by using solvents such as distilled water, ether, acetone, alcohol and *n*-butyl-alcohol. Twenty grams of dry seeds were added to 50 ml. of solvent and allowed to soak for 1 hr. The material was macerated in a blender for 2 min. and filtered. The filter disc method was used to determine antimicrobial activity. One ml. of a 24 hr. broth culture of bacteria was incorporated into 10 ml. of agar in a petri dish and then allowed to solidify; 1·5 ml. of a 2- to 3-day-old culture of fungus was similarly incorporated into 10 ml. of Sabouraud's dextrose agar. Filter paper discs were saturated with extract and allowed to dry, and this process was repeated four times. These discs were then placed on the surface of the infected nutrient agar and incubated for 24 hr. at 37°C., and the fungi infected plates were incubated for three days at 37°C. With each extract the test was repeated six times and a mean zone reading recorded. One hundred and ninety-five extracts from 39 seeds were prepared and tested; 16 of the seeds failed to exhibit any antimicrobial activity, but the remaining 23 were active.

Extracts of cardamon (green), Tonka angostura and celery were found to show antibacterial activity against six out of seven test organisms as well as against *B. subtilis*, *N. perflava*, *S. cholera suis*, *S. typhi murium*, *P. vulgaris*, *Tr. mentagrophytes*, *M. canis*, *Hel. sativum*, *Crypt rhodobenhani*, *Pan. digitatum*, and *Epid. interdigitale*. Anti-microbial activity was not increased by concentrating the extracts.

Antibacterials of coniferous seedlings

It is well known that the damping off of coniferous seedlings causes serious damage and in many cases complete destruction up to the appearance of the foliage. Once the cotyledons are fully developed and foliage leaves have failed to appear, complete destruction may be expected. Following the appearance of the foliage leaves the percentage of the damping off is greatly reduced or totally stopped. Nor does the disease appear when it could be expected in the presence of suitable conditions (high temperature, abundant moisture and excessive decomposing organic substances). Consequently it may be assumed that in these two developmental phases there must exist such a difference in plant substance which is

closely connected with the cause of damping off.

Seedlings of pines (*Pinus silvestris* and *P. nigra*) were examined before and after the appearance on the foliage leaves and at the age of one year.[4] Studies of antibiotic substances were made with the diffusion method. The substances were extracted with alcohol and chloroform and were examined on bouillon and glucose agar media. Test organisms were: *Micrococcus pyogenes* var. *aureus*, *Bac. cereus* var. *mycoides*, *Bac. megatherium*, *Proteus vulgaris*, *serratia marcescens*, *Pseudomonas syringæ* var. *capsici*, *Escherichia coli*, *Fusarium oxysporum* var. *aurantianum*, *F. moniliforme*, *Cladosporium herbarum*, *Boytytis cinerea*, *Rhizoctonia solani*, *Penicillium crustaceum* and *Gibberella fujikuroi*. The experiments were repeated with the *Fusarium oxysporum* and other fungi and bacteria isolated from dead seedlings.

On the basis of the results it is concluded that:

(1) The seedlings contain no antimicrobial substances before the appearance of the foliage leaves.
(2) The substance extracted from seedlings after appearance of foliage leaves, like the one-year plants, inhibits the Gram-positive bacteria.
(3) This substance has no antifungal effect, consequently offers no defence against the damping off fungi.
(4) In the case of Gram-negative bacteria there is no clear zone left.

The failure of the disease after the formation of the antibacterial substance suggests that the Gram-positive soil bacteria must have a certain role in the damping off of coniferous seedlings.

Inhibition of *Esch. coli* by amino acids

The nutritional requirements of *Esch. coli* for many amino acids is well known, but less is known of the inhibition of this organism by them. D-serine, 2-amino-5-heptenoic acid, norvaline and norleucine have been described as inhibitors of this class. Lately work has been done on 100 strains of *Esch. coli* derived from human fæces, urine and routine water supplies.[5]

A basal fluid medium containing salt, glucose, ammonium dehydrogen phosphate and depotassium hydrogen phosphate and Oxoid Kobe No. 1 was used. The plates were thoroughly dried before use. The amino acids used were all DL forms, serine, cystine, homocystine, leucine, norleucine, iso-leucine, valine, norvaline, sorcosine, aspartic acid, asparagine, methionine, threonine, glycine, glutamic acid, alanine, 2-amino-*n*-butyric acid, γ-amino-*n*-butyric acid, *x*-amino-iso-butyric acid, histidine and proline.

Colonies were picked off from MacKonkey bile salt agar into mineral salt solution, incubated at 37° for 8 hr., seeded on the surface of agar and dried off for ½ hr. at 37°. Six holes were then cut in the medium and 0·02 ml. of amino acid introduced into them. The plates were incubated at 37° for 18 hr. and examined for inhibition zones. All zones of less than 20 mm. were disregarded.

Of the 100 strains examined 12 were not inhibited by any of the amino acids used. Eighty-two were inhibited by one or more amino acids, and six strains failed to grow on the minimal medium except where it was supplemented by one or more of the amino acids. A number of inhibition patterns were formed. These results may offer a useful subsidiary test for identifying particular strains of *Esch. coli*, particularly in field epidemiological studies, in addition to those already used.

Growth of organisms in heavy water

In the mid 1930's when heavy water became available, workers experimenting on its biological effects reported delayed growth, complete inhibition, and morphological changes in many types of organisms, including bacteria. Some reported normal growth. Recently Walker and Syrett confirmed the inhibition of autotrophic growth of *Chlorella* by heavy water, but found less inhibition in the presence of glucose.

Growth of two strains of bacteria in buffered nutrient heavy water broth, prepared by redissolving lyophilised aqueous nutrient broth in 99·8% heavy water (Norsk Hydro), was compared with their growth in aqueous medium and in medium with various concentrations of heavy water. Small inocula were prepared by growing and suitably diluting overnight cultures in the experimental medium.[6]

In heavy water the growth of both strains was slower than in ordinary water. The specific growth rate in ordinary water was 2 times greater for *Staphylococcus albus* and 2·5 times for *Bacterium coli*. Even after repeated subculture in 99·8% heavy water medium the organisms were morphologically indistinguishable from those grown in ordinary water and the colonial morphology was unchanged.

In lower concentrations of heavy water the doubling time was roughly proportional to the antilogarithm of the concentration of heavy water.

The addition of glucose to heavy water broth produced an effect no greater than in ordinary water broth, and *Bacterium coli* was able to grow in a 99·8% heavy water medium with glucose and ammonia as sole carbon and nitrogen sources.

Sterilising platinum loops

A new form of steriliser has been described which can be attached to a Bunsen burner.[7] Those at present available are said to have the disadvantage of being bulky and hot and, in addition, although anti-splutter, resistant bacteria may escape in the air up-draught. The new appliance consists of a stainless steel tube with an expanded end which is held by a clamp in the hottest part of the Bunsen flame at an angle of 45°. Stainless steel is used because of its resistance to corrosion and failure to form bacteriostatic oxides which might contaminate the loop. The apparatus was tested with large loops carrying (1) heavily infected broth, (2) bacterial spores in aqueous suspension, (3) semi-solid "aggregates" scraped from agar cultures. Test organisms included *B. anthracis* and *M. phlei*. Immediately below the mouth of the steriliser, agar plates were exposed during test to catch gravitating micro-organisms which may have sprung away from the heating loop. The air vertically above the apparatus in use was similarly sampled by using an extension fitted to a slit sampler. No vegetative organisms were recovered, but spores occasionally were. This occurred when a contaminated proximal end of a loop remained outside the tube, which is avoidable. The trials were more vigorous than normal conditions. This method of flaming proved no more inconvenient than using an open flame, but a small carbonised residue sometimes required burning off.

It is surprising how few bacteriologists ever make spot checks to dis-

Table 1.—Growth of Four Micro-organisms in Nutrient Broth containing Tree Leaf Litter Extracts sterilised in Two Days

		Beech		Maple	
	Control water	Seitz-filtered	Auto-claved	Seitz-filtered	Auto-claved
Rhizopus nigricans .. .. mg./25 ml.	4·1	1·1	24·4	8·2	15·7
Aspergillus niger .. .. .. mg./25 ml.	7·4	1·7	31·4	41·1	38·7
Azotobacter .. .. .. sp. No. × 10^6/ml.	67	325	1	286	0
Pseudomonas fluorescens .. .. No. × 10^6/ml.	179	515	14	435	0

cover how efficient loop flaming sterilisation is in practice. It can be a highly dangerous procedure in some hands.

Fungistatic activity of beech extract

It is well known that beech litter is less susceptible to decomposition than is the litter of many other species, including maple. One reason for this may be the presence or absence of certain factors inhibiting or stimulating microbial growth. For example, factors inhibitory to various fungi have been shown to occur in leaf exudates of certain plants and in many plant extracts, whereas factors stimulating certain mycorrhizal and saprophytic Hymenomycetes have also been observed. Antibacterial factors have been demonstrated in extracts of oak and maple leaves, spruce needles, and in other species. Autoclaving of the extract has been shown to increase the inhibition of fungi and bacteria under the experimental conditions used.

Rather different properties of inhibition and stimulation were observed in a study in which newly fallen beech (*Fagus grandifolia*) and maple (*Acer saccharum*) leaves were extracted with cold water.[8] The dried leaves were milled, homogenised with 10 times their weight of cold water, filtered and then centrifuged to remove suspended organic material. The *p*H was adjusted to 6·8 and half of the extract sterilised by Seitz filtration and the remainder by autoclaving. Medium consisting of equal quantities of Difco nutrient broth and leaf extract was then inoculated with each test organism (Table 1). Fungi were incubated for 20 days and growth determined by dry-weight measurements. Bacteria were incubated for two days and growth estimated by plate counts. The results are shown in Table 1.

The fungi showed similar growth responses, as also did the bacteria, but the two groups differed from each other. Thus the fungi alone were inhibited by the filtered extract, but only that prepared from beech leaves was active in this way. The bacteria, however, were inhibited strongly by both autoclaved extracts which were stimulatory to both fungi tested. The significance and mechanism of the apparently separate bacterial and fungal inhibitors must await further investigation, but it is conceivable that the fungistatic activity of the filtered beech extract may have ecological significance in the field.

Inhibition of reversory metabolites

It has been previously shown that on a rational basis it is possible to formulate synergistic combinations of inhibitors for any particular bacterium. Given a knowledge of the metabolites essential for a given organism, then it is theoretically possible to predict what combinations of substances might act together as inhibitors. The biochemical pathway is involved so that the inhibitor blocks the biosynthesis of the metabolite. Chemically dissimilar inhibitors whose effects are reversible by the same metabolite probably interfere at different sites on a common pathway. Further studies have now appeared.[9]

The test procedure involved incorporation of graded doses of inhibitor in melted glucose salts agar, allowing to set in petri dishes and inoculating by surface spreading of 0·05 ml. of water suspension containing 50 to 150 bacteria. The inhibitory concentrations were taken as the smallest which prevented colony development after incubation at 37°C., during which time controls grew well. By reversal was meant full colony development from the inoculum as a result of incorporating a metabolite in the medium containing a minimal dose of inhibitor. The test organisms were *Aerobacter aerogenes* strain P, *Esch. coli* (2 strains), *B. subtilis* var, *niger*. The first inhibitors used were 6-mercaptopurine and riboflavine and the action of these was reversed by calcium pantathenate and biotin respectively. Other inhibitors known to be reversed by the same metabolites proved to be synergistic with these inhibitors. Thus D-serine, Na-propionate or Na salicylate was synergistic with 6-mercaptopurine; these synergisms were abolished by Ca pantothenate. Isonicotine acid or actithiazic acid was synergistic with riboflavin; the synergisms were abolished by biotin.

REFERENCES

1. H. G. Smylie, C. V. Webster, and M. L. Bruce, 1959, *B.M.J.*, Oct. 3.
2. V. J. Kinsella, 1959, *B.M.J.*, Dec. 19.
3. J. C. Maruzzella and M. Freundlich, *J. Am. Pharm. Ass.*, 1959, **48,** (6), 356.
4. R. Vamos and L. Vida, *Nature*, 1959, (4690), 915.
5. L. A. Rogers, *J. Med. Lab. Tech.*, 1959, **16,** (1), 48.
6. Elizabeth van Horn and G. C. Ware, *Nature*, 1959, (4689), 833.
7. H. M. Darlow, *Lancet*, 1959, (7104), 651.
8. Roger Knowles and Edward Laishley, *Nature*, 1959, (4693), 1169.
9. B. S. Stim, B. C. Arnwine and J. W. Foster, *J. Bact.*, 1959, **77,** (5), 566.

HOW TO MAKE RESEARCH PAY

(*Continued from page* 69)

is only one course for him to take. He must confront the research worker with an irrevocable decision coupled with complete candour about the reasons which have led up to it. This may give all concerned a rough hour or two but the all too common alternative of letting the man down lightly with semi-definite decisions and smooth half-truths produces a lasting resentment. I would make a further suggestion: that a flexible attitude be taken to part-time work designed to round a project off for publication. If research workers knew that this was a general practice they would be less irritated at sudden changes of their problem.

* * *

On re-reading these notes I have the feeling that everything I have said is very obvious. My former employers, who, though not perfect, made a serious and, in many respects, successful attempt to place their research on a rational footing, would probably agree. I remain aware, however, that such firms are an exception to the general rule: that research in industry is conducted by bashing on regardless and muddling through. I hope I am wrong; I fear I am right.

PLANT AND EQUIPMENT

▶SLIDING WEIGHT BALANCES

Ohaus double- and triple-beam sliding weight balances are now available from Shandon Scientific Co. Ltd., London. These balances, made by one of the largest balance manufacturers in the U.S.A., incorporate many notable technical features. Favourable tariff rates enable them to be marketed at competitive prices.

Included in the range is the Cent-O-Gram, a 311 g.-capacity model which offers the convenience of the sliding weight principle with the sensitivity of 0·01 g. The Cent-O-Gram is a triple-beam, single-pan model incorporating a special specific-gravity weighing platform, a built-in round spirit level and graduated end-reading scale and pointer to eliminate parallax error. The stainless-steel pan is automatically positioned in the pan holder. This balance costs £16 16s.

Three double-beam models are available, all of 2 kg. capacity and 0·1 g. sensitivity. Model 0-1550-S, at £10 12s., has 6-in. round plates in stainless steel (or in opal glass at £10 18s.). Model 0-1510, at £11 18s., has matched removable stainless-steel pans. Model 0-1560-S, at £12 18s., is similar to Model 0-1550-S but with a 160 g. capacity undivided tare beam.

The triple-beam models are single-pan types of 2,610 g. capacity (with attachment weights) and 0·1 g. sensitivity. Model 0-750-S with 6-in. steel plate costs £9 18s. Model 0-760 is similar, but with 180 g. capacity undivided tare beam, and costs £12 4s. Model 0-730, at £17 10s., is fitted with a removable 9-in diameter ×6-in. high aluminium animal box.

Ohaus technical features include semi-rigid self-aligning agate bearings and hollow-ground steel knife-edges; dustproof bearing covers; patented scale-plates with threaded hubs; and relief-etched stainless-steel beams to ensure that scale markings remain clear and unmistakable throughout the life of the balance. Special attention is given to corrosion-prevention by careful choice of materials and finishes. All models are available with metric, avoirdupois or grain calibrations.

Cent-O-Gram triple beam balance, model O-CG. Sensitivity 10 mg. with specific gravity weighing attachment

▶DETERGENT DISPENSERS

Two new automatic dispensing units for controlling the strength of the solution in the tanks of churn washers and medium-size bottle-washing machines have been introduced by Diversey (U.K.) Ltd., whose products are distributed by Deosan Ltd.

The Diversey Divomatic Master Solution Control Unit, Series 1000, is a new electronic feeding device which operates automatically and continuously tests the strength of the wash solution. A quantity of solid detergent is dispensed only when this is needed to maintain a predetermined or desired solution strength. The Diversey Dican Feeder is a precision device designed to feed a measured quantity of Diversey Dican XX for each churn washed in the normal type of automatic washer. The operation of the Feeder synchronises with the operating cycle of the whistle valve which controls the flow through the pre-rinse nozzle. The stroke of the piston in the Feeder can be adjusted to secure optimum solution strength in any plant.

Advantages claimed for these units are that the solution is automatically kept at uniform strength, with saving in labour and material. It is claimed that, with the solution always at optimum strength, cans and bottles are washed cleaner, and milkstone and scale is controlled.

▶ROTARY BOTTLE WASHER

R. Powley and Sons Ltd. have introduced the Apex Major, a larger version of their Apex rotary hydro bottle washing machine.

The Apex Major is suitable for all kinds of bottles, jars and containers, new or used, with or without labels.

It has two outputs, 1,440 and 2,400 items per hr., with a convenient adjustment for changing from one output to the other. As an extra, the machine can be supplied to give three outputs.

The bow-shaped front gives free access for the loading of the bottles into the holders and the removal of the clean ones as they emerge from the treatment.

On being inverted into the bottle holders the bottles are drained of dregs and are carried through the following treatment in a clockwise direction, with an intermittent movement.

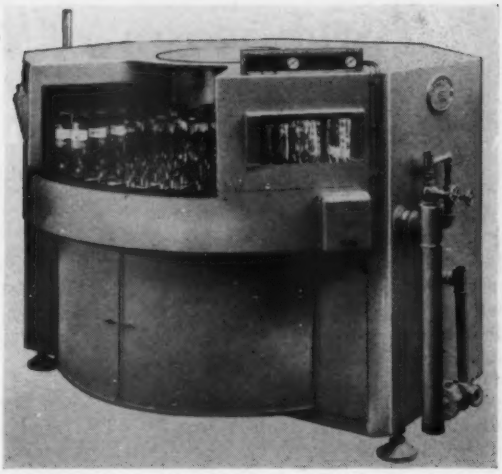
The first stage of treatment is a hot rinse which removes a large amount of soilage and residue and tempers the bottles for their entry, after draining, into the detergent section, where they receive a prolonged internal and external high-pressure jetting with detergent solution at 140°F. This cleans the surfaces and edges of every bottle and removes all labelling.

After draining, the bottles receive the final three stages of treatment with a suitable draining period between each. These are a hot rinse at 110°F., a warm rinse at 80°F. and finally a cold rinse with fresh mains water.

When the machine is supplied to handle labelled bottles, the detergent section is fitted with an endless travelling gauze band through which the solution must pass on its return to the detergent tank. Label fragments are sprayed off the band into a collector box, and a fine mesh filter, fitted under the band, collects minute particles of labelling which might pass through. When unlabelled bottles are being handled the detergent section is fitted with easily removable filter trays which

filter the solution before it passes to the pump.

The Apex Major can be supplied with any of the following thermostatically controlled methods of heating for the detergent tank—steam—circulating water heater for coal-coke, oil, wood or gas-firing—in-built gas-fired heat exchanger system—in-built oil-fired heat exchanger system. The water for the pre-rinse, warm rinse and hot rinse is heated through heat exchange coils immersed in the detergent tank.



Rotary hydro bottle washing machine which can operate at two speeds: 1,440 and 2,400 bottles or jars per hr.

▶SCREW ELEVATOR

A High-Speed Screw Elevator has been introduced by James Hodgkinson (Salford) Ltd. It has been designed primarily for handling boilerhouse smalls where for one reason or another it is not convenient, or possible, to prepare a concrete ground hopper or pit. It is suitable for feeding the hoppers of "Low Ram," chain grate or underfeed stokers under such circumstances.

The elevator consists of a steel tube in which rotates a worm housed in totally sealed, self-aligning ball bearings and driven by a constant speed, totally enclosed motor mounted on a platform at the head of the casing. A short standard chute extends from the head to which an additional section or breeches piece can be added, provision being made for this to be swivelled to suit site conditions. At the tail the worm is exposed for the entry of coal. An adjustable device enables the head to be supported from any convenient structure in the boilerhouse.

Each unit will handle up to 1½ tons of smalls per hr. and feed direct to the stoker simply by resting the tail on a pile of coal and lifting the head into position over the stoker hopper. The elevator is entirely self-cleaning and no running maintenance is required since the bearings are grease packed and sealed for life. Costly erection expenses and delays are eliminated—the machine can be working within half an hour of delivery.

The elevator is supplied in the following standard lengths: 13, 14, 15, 16, 17 and 18 ft.

Location of Isojacket heating an argon chromatographic unit

▶ELECTRO-HEAT

"Resistance heating is the one electric method directly comparable with methods using alternative fuels, although arc, induction and dielectric heating are also unique. In resistance heating, the efficiency of conversion of electrical into heat energy is 100 per cent. Moreover, this applies to all stages of control—the heat input to the equipment is always exactly equal to the electrical imput. With alternative fuels, the efficiency of combustion, *i.e.* of heat generation, is never 100 per cent."

This was said by Mr. C. T. Melling, a member of the Electricity Council, and chairman of the British National Committee on Electro-Heat. He was giving the opening address to a post-graduate course of 12 lectures on Electro-Heat organised by and held at the College of Advanced Technology, Birmingham.

Mr. Melling said that combustion efficiencies quoted for fuel-fired equipment were often based on laboratory tests and were seldom achieved in practice. To get the best results out of such equipment often required supervision by a combustion expert, whereas electric heating equipment could function unattended. In addition, electrical equipment could, in general, be more efficiently heat insulated. Where indirect fuel firing was necessary, *i.e.* where products of combustion would be harmful, there was still a further loss of efficiency caused by the loss in transferring heat to the muffle or other protective device. All these factors brought down the net cost of heating by electricity, which was sometimes less than that of fuel-fired equipment, the thermal efficiency of which could be as low as 10-15%.

In some processes cleanliness, denoted generally by the absence of products of combustion, was essential.

▶HEATING JACKET

Isopad Ltd. have produced a heating device for W. G. Pye and Co. Ltd. The problem was to design and construct heating equipment for the 4 ft. long × 2½ in. diameter heating column of the Pye Argon chromatograph unit. The requirements were exacting—provision for any selected temperature up to 250°C., with ½° accuracy, even distribution of temperature over the whole length and a temperature rise at the rate of 10°C. per min.

The answer was an Isojacket incorporating two interleaved heating circuits—one enabling the temperature to be maintained at the selected level, the other catering for the quick rise in temperature specified. A series of experiments resulted in the exact additional heating for the ends of the jacket, plus certain draught screens and cooling slots.

Microcosm of Modern Therapeutics

The Seventh Edition of The British Pharmaceutical Codex

is reviewed by S. J. HOPKINS, F.P.S

THE reputation and value of the British Pharmaceutical Codex increases with every edition. The new volume,* the seventh in 52 years, follows the pattern set in post-war editions by its emphasis on new synthetic compounds and a further reduction in the number of vegetable drugs, and is thus a microcosm of modern therapeutics.

Out with the leech

The deletions in the general monographs section number 99 compared with 254 in the 1954 edition, and with them goes the last survivor of an age that considered bloodletting a sovereign remedy, namely the leech. Other deletions include long-established vegetable drugs such as jalap and krameria, and synthetic compounds, exemplified by hexamethonium, diphenan and thiacetazone, which have been superseded by more active or less toxic drugs. Dyes for colouring purposes, such as orange G, amaranth and tartrazine, are also omitted, as detailed standards for food colourings are issued by the British Standards Institution. The deletion of certain other substances which are still widely prescribed, such as sodium propionate, tocopherol acetate and zinc peroxide, is less easy to understand, and seems to run contrary to the Codex principle of retaining drugs which have the confidence of many practitioners "unless there is some overriding reason for their exclusion."

Seventy additions

The additions to the Codex, 70 in all, are much more interesting, and a very pleasing feature is that drugs deleted from the B.P. are no longer automatically transferred to the Codex pending their final banishment. The antibiotics new to the Codex, bacitracin and neomycin, also occur in the B.P., but two new salts of chloramphenicol, the cinnamate and palmitate, are described, as well as the benethamine derivative of penicillin. The chloramphenicol compounds are free from the bitter taste of the base, and are suitable for the formulation of liquid preparations for oral use. Benethamine penicillin is only slightly soluble, and when injected an effective blood level of penicillin will be maintained for three or four days after a single dose. The other additions are all chemical substances, with the exception of hamamelis water. The inclusion of this galenical is very surprising, as although it has been in use for many years and was described in the B.P.C. 1949, it hardly appears to qualify at this late hour as a "substance which . . . evidence and experience have shown to be of value."

New antihistamines are represented by triprolidine, and new substances with an antiseptic action include chlorhexedine, dequalinium, nitrofurazone and hexachlorophane. This latter substance appears to be slower in action than some other antiseptics, but it retains its activity in the presence of soap. When such soaps are used daily, hexachlorophane accumulates in the skin, and there is a marked reduction in the bacterial flora. Such soaps have applications in hospital practice to prevent cross-infection, and in the handling of food.

Several of the new drugs have an action on the central nervous system. Inhalation anæsthetics are represented by halothane, a non-explosive fluorinated ethane compound; glutethimide is an example of a non-barbituric hypnotic, and central stimulants include pipradol and phenmetrazine. Bemigride is specific in the treatment of barbiturate poisoning. Aminophenazole is an analeptic, and reduces the respiratory depression caused by morphine and similar drugs. Nalorphine and levallorphan antagonise the actions of morphine and levorphanol respectively, and the methyl derivative of the optical isomer of levorphanol, dextromethorphan, is a cough centre depressant without other pharmacological properties. Tranquillising drugs are represented by benactyzine and meprobamate. The inclusion of tolbutamide, an orally active hypoglycæmic compound, marks an important advance in the treatment of diabetes mellitus. The range of new diuretics includes aminometradine, one of the first of the effective non-mercurial diuretics, now almost replaced by chlorothiazide. In spite of the advances made in this field, the Codex describes two mercurial diuretics, chloromerodin for oral use, and meralluride for intramuscular injection.

Auxiliary compounds

Apart from therapeutic substances, the list of additions includes auxiliary compounds such as dimethicone 20, a silicone lubricant and water-repellant; isopropyl myristate, a substitute for vegetable oils in preparations for external use; hard and liquid macrogels for ointment bases, and methylcellulose 20, a useful emulsifying and dispersing agent.

In the General Monographs describing the drugs included in Part I of the Codex, the substance and its origin or a method of preparation are briefly described, together with tests, action and uses and dose. The sections on actions and uses are models of clarity and conciseness, and convey a remarkable amount of valuable information, but at the same time they have the defects of their qualities. They are the work of a committee, and represent the essence of published and private experience. Consequently no references are given to support the statements made, and in this respect the Codex differs sharply from many other works of reference. This absence of references can be irritating, particularly when less common uses are referred to, as in such cases it is often helpful to be able to refer to the original literature.

Parts II, III and IV of the Codex refer to antisera and vaccines, human blood products and ligatures respectively. Part V covers surgical dressings, the principal points of interest being the deletion of penicillin gauze, and the addition of tests to exclude the use of fluorescent brightening agents. Many prepara-

* *British Pharmaceutical Codex* 1959. *Pharmaceutical Press. Pp. xxix*+1300. 70*s. net.*

tions have been deleted from Part VI, the Formulary Section, including some which appear in the B.N.F., and are therefore presumably still in common use, but a few pills still remain. The method of making eye-drops has been revised with a view to ensuring the exclusion of bacteria and moulds, but further work on this problem is required. Several new ointment bases have been devised, and non-ionic and cationic ointments are included. Other additions include a number of preparations omitted from the B.P. 1958.

The 16 appendixes add to the value of the book. For the first time some information is given on milli-equivalents, although this appendix could have been expanded with advantage. Another new appendix refers to uniformity in the diameter of tablets.

The Codex is thus a book of standards as well as reference, and the new edition will enhance its unique position.

OTHER BOOK REVIEWS

Precipitation from Homogeneous Solution

By Louis Gordon, Murrell L. Salutsky and Hobart H. Willard. Wiley, New York and Chapman and Hall, London, 1959. *Pp.* viii+187. 60*s* or $7.50.

PRECIPITATION from homogeneous solution is an analytical method which has shown much development in the years since 1937 when Willard and Tang called attention to its many advantages. The technique is one in which the precipitant is slowly generated by a homogeneous chemical reaction within the solution rather than being added in the usual manner. The precipitate so formed is dense, readily filtered, and shows little co-precipitation.

Papers on precipitation from homogeneous solution are scattered through many journals and the present book, written by three authors who have contributed much to the existing literature in this field, brings together this information in one volume. The results of much unpublished work by the authors are also included.

After a short introductory chapter, the book contains six chapters dealing with the principal types of compound which have been precipitated from homogeneous solution—hydroxides and basic salts, phosphates, oxalates, sulphates, sulphides and miscellaneous compounds. General principles are discussed and reagents likely to produce pure dense precipitates are described; detailed procedures are given.

The next two chapters describe co-precipitation and fractional precipitation from homogeneous solution and form an excellent account of the theory of precipitation. The distribution of foreign ions in the solution between solid and liquid phases and the analytical significance of this is discussed. The application of such distribution coefficients in analytical chemistry is also described.

The final chapter describes the application of the principles of precipitation from homogeneous solution to chemical technology and to separation processes, describing the production of reproducible carriers for radioactive materials and the preparation of special products. The book is well arranged and presented and is valuable as an up-to-date survey of this particular field at an interesting stage in its development. It will appeal particularly to those analysts who are keen to develop new methods and to improve existing ones.

R. E. STUCKEY.

The B.V.C. Supplement

The British Veterinary Codex Supplement 1959. Pharmaceutical Press, London. Pp. 133+ix. 35*s. net.*

THE first edition of the British Veterinary Codex, published in1953, is having considerable influence both in Britain and overseas on the preparation and use of substances important in veterinary medicine. The second edition of this Codex will not appear before 1963 and to keep pace with rapid developments the present supplement has been compiled. Publication has been deliberately arranged to follow that of the 1958 B.P. and the 1959 B.P.C. so that common standards and formulæ can be referred to without ambiguity.

There are 180 monographs grouped into three parts. Part I deals with Drugs and Chemical Substances, Part II with Antisera and Vaccines and Part III with the Formulary. Five appendices refer to changes in official tests; there is a most useful list of trade names and other synonyms together with a therapeutic index and a comprehensive general index.

In Part I, 47 new substances appear with appropriate definitions, standards of manufacture, and authoritative accounts of their actions, uses, toxicity and dosage in horses, cattle, sheep, pigs, dogs, cats and poultry. In addition 38 monographs of the 1953 edition have been amended to comply with new standards of preparation or assay.

Part II deals entirely with antisera, vaccines and tuberculins for the treatment of animals. Five new monographs are included, together with nine which have been completely rewritten and three considerably amended. Full details are given of preparation, standardisation, actions and uses. The general monograph on bacterial vaccines has been modified and a new monograph on mixed bacterial vaccines added.

The Formulary (Part III) includes 35 new monographs mainly describing the new substances of part I. There is also a useful new monograph on antibiotics as dietary supplements. Part III also gives amendments to 42 monographs, but these are less interesting in that most are consequent upon recent changes in B.P. or B.P.C. requirements.

The book maintains the high standard of presentation of technical information associated with the Pharmaceutical Press. Used in conjunction with the 1953 volume it is a unique source of information which will improve understanding between manufacturers, distributors and users of drugs of veterinary importance.

R. J. FITZPATRICK.

Cosmetic Materials and Test Methods

NEW raw materials and testing methods were among subjects discussed at the annual technical meeting of the U.S. Society of Cosmetic Chemists, held on December 2 in New York.

Odour measurement

L. C. Barail, consulting biochemist, said that empirical testing methods had almost all been abandoned. Scientific methods had replaced them. Two examples were the measurement of odours and the utilisation of radioisotopes.

The measurement of the intensity of odours has been empirical for a long time, being done without instruments or with unreliable apparatus of low efficiency. No accurate and reproducible results have become available. Today, the *Osmagraph* permits the accurate measurement of the intensity of all odours, faint or strong. Odours can now be classified into 300 intensities, which are expressed numerically and are reproducible within a margin of 3 to 4%. This is particularly valuable in the testing of skin or air deodorants, or the odour contamination from within or without through packaging materials used in the cosmetic trade, or many other applications.

Isotopes

The use of radioisotopes as tracers in animals and human subjects studies has greatly increased. Tracer studies are conducted to establish among other things the penetration or the superficial retention of chemicals by the skin and mucous membranes. While some radioisotopes are dangerous and others not recommended, a few are safe and give results which will greatly contribute to the advancement of cosmetic research.

P.V.A. in hair sprays

Paul Weitz of the National Starch and Chemical Corporation described the use of vinyl copolymer in cosmetics.

Vinyl acetate copolymer is both solvent- and water-soluble. Its ability to form a water-soluble salt by neutralisation with AMPD (2-amino - 2 - methyl - 1,3 - propanediol) is a useful formulating tool. Unmodified it is not soluble in tap water but can be dissolved by soapy water. When neutralised it becomes water-soluble.

The experience of companies using this resin for aerosol hair sprays shows that it has satisfactory affinity for hair, good lustre and curl control, and is non-hygroscopic, non-tacky and soap soluble. Commercial cold filling methods can be used, and tin-lined cans are used without corrosion problems.

Tests for health safety include skin and eye irritation and acute oral toxicity. A three month inhalation study is in progress.

A patent has been applied for covering the use of the resin and its neutralisation in aerosol hair sprays.

New gums

New polysaccharide gums produced by microbial synthesis were discussed by D. L. Miller, R. F. Anderson, A. Jeanes, and S. P. Rogovin of the Northern Regional Research Laboratory, Peoria, Illinois.

Phosphomannan is a new phosphorylated mannan produced from glucose by a new yeast, *Hansenula holstii*, NRRL Y-2448. The polymer of the sugar mannose carries chemically combined phosphate groups and is different from any polysaccharide previously known. The major components are mannose, pyrophosphate and potassium in the approximate ratio of 10 : 1 : 2.

Phosphomannan is produced as a white, slightly hygroscopic powder that dissolves readily in water. Solutions are clear and thixotropic and at concentrations above 1% have gel-like aspects. Viscosities of the 1 and 1·5% solutions are comparable with those of some of the commercial gums. It complexes readily with borax to give a cohesive gel that does not adhere to glass. Now under development are potential uses in hand lotions, paper, pharmaceuticals, textiles, drilling muds and food products.

A new product, Polysaccharide B-1459, was announced by the N.R.R.L. in September 1959. It is a high molecular weight heteropolysaccharide produced from glucose by the bacterium, *Xanthomonas campestris*, NRRL B-1459. Major components are mannose, glucose, potassium glucuronate, and acetyl in the approximate molar ratio of 2 : 1 : 1 : 1.

The gum is a soft, bulky powder slightly coloured by pigment from the culture. The solid swells in water and dissolves to form homogeneous, opalescent, pseudo-plastic solutions that set to a soft gel when cold. Solutions increase in viscosity in the presence of salt and are stable even when heated. Borax has practically no effect on the viscosity. Its unusual properties would indicate general and speciality applications in fields such as foods and pharmaceuticals.

NEW COSMETIC INGREDIENT

Dextro-rotatory lactic acid is claimed to have proved a successful treatment of psoriasis by J. Böss in an article in *Seifen, Oele, Fette u. Wachse* (1959, (11), 319). He states that an Austrian firm has produced dextro-rotatory lactic acid on a large scale for the first time, and because of its therapeutic effect on the skin recommends it as a new cosmetic ingredient. A new method for determining dextro-rotatory lactic acid is given.

DETERGENT BARS

Milled detergent bars with a soap-like feel comprise a sodium soap (preferably 10-35%), a sulphate or sulphonate synthetic detergent (preferably 15-40%), and a starch or starch derivative gelatinised to such an extent that all anistropy has disappeared (15-70%). The soap is preferably a coconut oil or tallow type soap and may contain minor proportions of potassium, ammonium and amine soaps. Seven examples of formula are given, one of which uses an alkyl glyceryl ether sulphonate.—*Brit. Pat.* 796,627.

HAND PASTE

A cleaning paste for hands which removes all kinds of printing dyes containing natural and artificial resins is prepared by mixing 2 kg. of soap chips, 10 kg. of 99·8% denatured ethanol, 6 kg. of diethylene glycol monoether acetate (" carbitol acetate "), 2 kg. of diethylene glycol monoethyl ether (" carbitol "), 1 kg. of ethylene glycol monoethyl ether (" cellosolve "), 2 kg. of sodium hydroxide, 0·25 kg. of glycerol, 0·25 kg. of castor oil at about 85° to 90°C., until a uniform solution of the soap chips is formed. After cooling, 12 kg. of pumice powder or quartz sand is stirred into the gelatinous paste.—*Norwegian Pat. Appln.* 126,436.

NEWS . . .

Progress towards vaccine for colds

A TECHNICAL advance of great importance in the study of the common cold has been made by the Medical Research Council. Their Common Cold Research Unit at the Harvard Hospital, Salisbury, which was formed in 1946, has succeeded in growing several strains of virus from colds outside the body in cultures of human embryonic kidney cells. At least some will grow also in monkey kidney cultures. The viruses produce destructive effects in the cultures, so that their presence can be detected without the need to determine at every stage whether the cultures will still produce colds in volunteers.

A method of detecting virus by such a laboratory method has been the Unit's first objective during more than thirteen years' work.

The success is the end of the first long phase of the attack on colds. It could eventually lead to the production of a vaccine to produce complete or partial immunisation against the common cold. But there is still a long way to go, in spite of the over-enthusiastic reports in some newspapers.

A series of steps led to the results now reported. It was first found that virus would survive to a limited extent in cultures of human embryo kidney, but evidence that it had multiplied was inconclusive. It was next discovered that in such cultures containing common cold virus, certain other viruses would not grow or would grow very badly. Using this phenomenon as a guide, fluids in which the kidney cells were grown were modified in various ways and a better medium found in which the results obtained were more striking and regular. It was then discovered that when virus was grown at a few degrees below blood heat (91°F. or 33°C.) it would do better, and when the culture was kept a little on the acid side, it would produce visible destructive effects on the cells in the culture.

The viruses now described—called the Salisbury viruses—are unlikely to be the agents causing all common colds. It is not known that they even cause a majority of colds; but the way is now open to investigate the question of how many different types of virus there are, and whether different ones prevail in different years as happens with influenza. It can also be ascertained if they are susceptible to the M.R.C.'s anti-viral agent *Interferon*, described in MANUFACTURING CHEMIST, May 1959, p. 194.

The Ministry of Health point out that none of this could have been found out without the help of the 6,390 volunteers who have visited the Unit. For many reasons—not least because there may be other cold viruses waiting to be discovered—volunteers are needed just as much now as before—perhaps more so, in order to quickly exploit this promising entering wedge.

William Palmer, 65-year-old chemist at the C.W.S. soapworks, Irlam, Lancs., is presented with an illuminated address and cheque by C. W. Fulker, a director, to mark his 50 years' service with the Society. Mr. Palmer, who is a brother of Lord Rusholme, will go on working. He first went to the factory in 1909.

Marchon to make detergents in Italy

Marchon Products Ltd., a member of the Albright and Wilson group, plan to manufacture detergent raw materials in Northern Italy. Their wholly owned subsidiary Marchon Italiana, hitherto a trading company, will run the plant, which will be Marchon's first overseas manufacturing venture. The factory site is at Castiglione delle Stiviere, about 80 miles east of Milan. It is anticipated that the plant will be completed by the end of the year.

Drug costs: new appeal to hospitals

Fresh efforts are being made by the Ministry of Health to persuade hospitals to instruct junior medical staff on prescribing costs. To help senior doctors engaged in this instruction an 8-page memorandum entitled "Economy in Prescribing" has been prepared in which it is pointed out that since 1949 the cost of the pharmaceutical service has doubled, a bigger increase than any other branch of the Health Service. Frequent reference is made to the Hinchliffe report on the cost of prescribing. Doctors are warned against ordering excessive quantities of drugs and prescribing expensive or over-elaborate drugs. The work of the joint committee on prescribing and their classification of drugs is reviewed and the attention of doctors is drawn to the British National Formulary, Prescribers' Notes and Comparative Price-Lists. It is suggested that undergraduates at medical schools and new graduates might profit by visits to regional pricing offices, and the assistance of these offices is offered to work out prices of specimen prescriptions for teachers wishing to use them in their course of instruction.

The Ministry has also sent to hospitals a separate memorandum summarising those recommendations of the Hinchliffe Committee which affect the hospital service. Hospitals which have not yet adopted the suggestions are urgently asked to do so.

Medopharma now independent

John Ramage and Victor Fox, for many years director and works manager, respectively, of Clinical Products Ltd. of Richmond, have joined the board of Medopharma Ltd., a former subsidiary of Clinical Products Ltd.

Medopharma, as an independent company, is now operating a comprehensive manufacturing and packaging service to the pharmaceutical industry from new factory premises at 158-162 Tooting High Street, London, S.W.17.

Wax plant extensions

Owing to the increasing demand for their high melting-point waxes in powder form, Abril Industrial Waxes Ltd. have had difficulty in maintaining prompt deliveries to their customers.

The company is now installing new plant which will enable them not only to meet the pressure of demand, but also to provide wax powders with a more even particle-size distribution centred on 75 microns (200 BSS).

Phosphate ship ordered

A & W (Overseas Developments) Ltd., a company of the Albright and Wilson group, have placed an order with the Burntisland Shipbuilding Co. Ltd. for a motor cargo vessel of about 10,000 tons deadweight. The vessel will carry phosphate rock to the A & W factories at Oldbury, near Birmingham, and at Portishead, near Bristol. Phosphate rock is imported largely from Florida and North Africa.

People

R. E. Huffam has been appointed vice-chairman of A. Boake, Roberts and Co. (Holding) Ltd. He has also accepted an invitation to join the main subsidiary A. Boake, Roberts and Co. Ltd. as vice-chairman.

Robert W. Ramsay, director and general manager of Evans Chemicals Ltd., contract packaging specialists, has been appointed managing director of the company. Mr. Ramsay joined the company as its buyer in 1946. In 1950 he was appointed a director and secretary of Biometica Ltd., an associated company of Evans Chemicals Ltd. In January 1958 he was appointed to the board of the main company.

Philip Colebrook, managing director of Pfizer Ltd., has also been appointed managing director of Kemball, Bishop and Co. Ltd. Mr. Colebrook succeeds **W. W. Muir** and **R. F. Kemball** joint managing directors of Kemball, Bishop and Co. Ltd. Mr. Muir is remaining on the board in an advisory capacity. **John Platt** has been appointed general works manager of Kemball, Bishop. Mr. Platt, who was formerly a planning executive of Pfizer Ltd., is a Yorkshire man with long experience in the chemical industry. He is a graduate of London University.

A. W. J. Caron, D. J. Mann and **J. P. Stubbs** have been appointed members of the board of Unilever Ltd. It is intended to propose them for election to the board of Unilever N.V. Mr. Caron, who joined Unilever in 1938, has been a member of the management of the German businesses of the company since 1952. Mr. Mann, head of personnel division, has been with the company since 1933. Mr. Stubbs joined the company in 1932. He is a member of the executive of the marketing division.

R. M. Dickson, who has been the Scottish Area Director of Boots for the past seven years, has been appointed London Director and Southern Area Director. Mr. Dickson was appointed a director of Boots Pure Drug Co. Ltd. last April and has been a director of Boots Cash Chemists (Northern) Ltd. since 1948. He joined Boots in 1923. He will be succeeded as Scottish Area Director by **Henry J. Fraser,** who also becomes a director of Boots Cash Chemists (Northern) Ltd. Mr. Fraser has been the territorial general manager of the company's largest area—reaching from Dundee to the Orkneys—since August 1947. He will be succeeded as territorial general manager of this most northerly area of Boots by **J. Whyte,** who has been manager of the Boots branch in Argyle Street, Glasgow, since 1953. Mr. Whyte joined Boots in 1928.

R. W. Ramsay

P. Colebrooke

Plenty and Son Ltd. announce the retirement of **W. H. S. Aplin** after more than 20 years' service. **J. F. Hall-Craggs** who has been elected to fill the vacancy on the board is the director in charge of the company's filter and chemical plant division.

Shell Chemical Co. have appointed **P. C. Daley** as solvent sales representative in an area covering the districts of Staffordshire, Shropshire, Herefordshire, Worcestershire and a part of Warwickshire, which includes Birmingham. Mr. Daley joined Shell Chemical Co. in April 1948.

Dr. Cyril Webber has resigned his appointment as technical assistant to the managing director, Shell Chemical Company Ltd., in order to take up directorships with Yarsley Research Laboratories Ltd., and Yarsley Testing Laboratories Ltd.

M. A. E. Hodgson has been appointed development director of the Heavy Organic Chemicals Division, I.C.I. from February 1. **R. Haslam** has been appointed personnel director of the Nobel Division with effect from February 1, in succession to **Dr. A. C. Richardson,** who has retired. **C. G. Harris,** General Chemicals Division Research Director has retired. He joined Synthetic Ammonia and Nitrates Ltd. in 1929. In 1931 he joined General Chemicals Division and was appointed research manager of that Division in 1951 and research director in 1953.

The sales manager of Borax and Chemicals Ltd., **H. F. Barnett,** and the secretary, **W. C. Steer,** having reached retirement age, retired on January 31. They have been with the company since its inception 21 years ago and have been concerned with the sale and distribution of *Three Elephant* brand products for well over 30 years.

P. J. Gilbert, for over five years the representative in the Midlands, succeeds Mr. Barnett and **B. W. Green,** who joined the company in 1951, succeeds Mr. Steer.

Lord Netherthorpe has joined the board of Fisons Ltd. As Sir James Turner he was well known as president of the National Farmers Union.

L. O. Smith, since 1946 general manager of the London Branch of Parke, Davis and Co., has been elected a director of Parke Davis Inter-American Corporation Ltd. (Ontario). He joins a board comprising H. J. Loynd, president of Parke, Davis and Co., W. R. Jeeves, vice-president and director of Overseas Operations, together with three other directors.

John F. Boucher, M.P.S., who has represented Ferris and Co. Ltd., Bristol, on the wholesale section of the P.A.T.A. Council since 1951 and has been a vice-president for the past three years, was elected president of the Proprietary Articles Trade Association on January 14. In addition to being engaged in promoting and extending the business of Ferris and Co. Ltd.—now incorporated in J. R. Gibbs Ltd., an associate company of the British Drug Houses Ltd.—Mr. Boucher has been an active representative of his firm on the Association of British Pharmaceutical Industry, having served as Chairman of Division A and as President of the Association in 1954/55.

Monsanto Chemicals Ltd. have appointed **W. H. Ritchie** as development manager—projects, and **N. G. H. Thomas** as development manager—products. Mr. Ritchie, who joined Monsanto in 1937, will be responsible for progressing the manufacture of new products, and for development planning. Mr. Thomas, who joined Monsanto in 1946, will be responsible for the development and introductory marketing of new products, and for market research.

A. Wormald, commercial director of Fisons Ltd. from 1950, and formerly managing director of the company's Chemical Division, is one of two managing directors of the parent board of Fisons Ltd. which became a holding company on January 1. In addition to his duties as a managing director of the holding company, Mr. Wormald is in executive charge of the company's principal non-fertiliser interests, *i.e.* Fisons Pest Control Ltd., Genatosan Ltd., Whiffen and Sons Ltd., Benger Laboratories Ltd., and Fisons Chemicals (Export) Ltd. Mr. Wormald is 47 and has spent the whole of his business life, except for war service, in the chemical industry.

John Watson Napier, 53, is the other managing director of Fisons Ltd. He also becomes the first chairman and managing director of Fisons Fertilisers Ltd. He is a former president of the Fertiliser Manufacturers Association.

STURGE'S NEW LABORATORIES

Left: The main microbiological laboratory, part of a new two-storey laboratory block just opened in Birmingham by John and E. Sturge Ltd., as part of a £100,000 research and development programme, which is being carried out under the direction of the joint managing director, Dr. E. R. S. Winter. One of the main activities will be a study of the microbiological production of citric acid. Right: Part of Sturge's new two-storey laboratory block just opened in Wheeleys Road, Birmingham, as part of the new programme (see MANUFACTURING CHEMIST December, p. 507).

The laboratory is constructed in reinforced concrete. The exposed frame is finished in white Mineralite to contrast with the panel brickwork in black and fawn and a decorative end gable panel of blue facet tiles upon which is exhibited the emblem of the company.

In designing the two main floors the varying demands of research have been studied. The areas are subdivided by a system of movable partitions, and to provide a degree of flexibility a comprehensive layout of all services has been installed, together with adjustable light fittings set in heated ceilings.

S. W. Gray, company secretary of Ciba Laboratories Ltd., Horsham, retired at the end of 1959 after 38 years service with the Company. His successor is **K. E. Sewards-Shaw,** who was formerly deputy secretary.

Miss L. E. Sargent has been appointed a sales representative for Charles and Read Ltd., carton manufacturers. Miss Sargent was buyer for Coty (England) Ltd. for 13 years and for 8 years she was buyer for Elizabeth Arden Ltd.

J. E. C. Bailey, chairman and managing director of Baird and Tatlock (London) Ltd. and Hopkin and Williams Ltd., is visiting the companies' branches, agents, representatives and customers throughout East, Central and South Africa.

Dr. A. J. Amor, I.C.I. principal medical officer for the past 13 years, has retired. He joined the I.C.I. Metals Division in 1935 and served as medical officer at the Swansea works. During the last war he was chief medical officer in the Ministry of Supply. He was awarded the C.B.E. in 1950.

He is succeeeded as principal medical officer by **Dr. A. Lloyd Potter,** who since 1946 has been medical officer of I.C.I. General Chemicals Division in Cheshire. Dr. Lloyd Potter served with the R.A.M.C. in the Middle East and East Africa during the war and was previously in consultant surgical practice in Lancashire.

Hickson and Welch (Holdings) Ltd., have made the following appointments: W. G. Oliver, Director of Hickson and Welch Ltd. M. N. Salmon and C. D. Cook, Directors of H.T.I. Co. (G.B.) Ltd. A. P. Clarke and E. A. S. Price, Directors of Richardson and Starling Ltd.

Death of editor of "Chemistry and Industry"

It is with great regret that we report the death on Tuesday, January 12, of William Ernest Dick, B.SC., F.L.S., editor of *Chemistry and Industry*, the weekly publication of the Society of Chemical Industry. He was 45. Bill Dick, as he was widely known, was an outstanding technical journalist, his most notable achievement being his editorship of *Discovery*, which journal he served for 12 years. He was an author as well as an editor, his most recent book being "Atomic Energy in Agriculture." His death represents a tragic loss to technical journalism and we offer our sincere sympathy to his widow, Esther Dick.

Instruments Exhibition for Russia

As a result of the report to the Council by the three-man delegation of the Scientific Instrument Manufacturers' Association of Great Britain, which went to Moscow at the beginning of November, and the support from 30 members of SIMA, an exhibition of British scientific instruments will be held in Moscow from June 16 to 26, 1960.

Pharmaceutical figures honoured

The President of the Pharmaceutical Society, Mr. G. H. Hughes, at a meeting of the Council of the Society, referred with pleasure to the inclusion of the following in the list of New Year Honours: Prof. D. M. Dunlop, University of Edinburgh, Privy Council Visitor to the Society's examinations in Scotland (Knight Bachelor); Professor S. Alstead, University of Glasgow, member of the Board of Examiners for Scotland (C.B.E.); Mr. E. A. Hebron, M.P.S. Bebington, and Mr. D. E. Lovett, F.P.S. Singapore (M.B.E.).

Threat to price maintenance

At the last quarterly meeting of the Council of the Proprietary Articles Trade Association concern was expressed at the widespread press reports that the government had under serious consideration the banning of resale price maintenance, for which a legal sanction was provided by Section 25 of the Restrictive Trade Practices Act. The Council considered that any such step could only result in demoralisation of, and hardship to, the distributing trades and their employees.

A new venture for Shell

The interests of the Royal/Dutch Shell Group of companies, Continental Oil Co., and the Union Stockyards and Transit Co. of Chicago, in the liquefied natural gas field are to be developed through the medium of a jointly owned company to be known as Conch International Methane Ltd.

Two more mergers planned

The reorganisation and regrouping of British industry through the instrument of the take-over bid continues apace, with the chemical and pharmaceutical industries coming in for their share of take-overs. The new year opened with news of two important mergers: Albright and Wilson and A. Boake Roberts, and Aspro-Nicholas and Griffith Hughes.

Albright and Wilson and Boake, Roberts

Proposals for a merger of these two companies were announced on January 25. Albright and Wilson, one of the biggest chemical manufacturers in the country, have grown rapidly in the past 10 years. Boake, Roberts, an old-established East London firm, produces perfumery chemicals, plasticisers, fine chemicals, etc. The merger will be effected by an offer of Albright and Wilson shares on the basis of one ordinary stock unit of 5s. of Albright and Wilson plus 2s. in cash for each ordinary 5s. stock unit of Boake, Roberts, and one 5% cumulative preference stock unit of £1 of Albright and Wilson plus 1s. in cash for each 5% cumulative £1 preference share of Boake, Roberts.

The *Financial Times* estimates that the offer is worth £4 million and would create a group with a market capitalisation of £45 million.

If the merger is carried through, Boake, Roberts propose to declare in respect of the year ending March 31, 1960, a second interim dividend of 9½% (less income tax) in place of a final dividend.

Albright and Wilson expect to declare a second interim dividend (to be final) of 13½% (less income tax) in respect of the year 1959. Ordinary stockholders of Boake, Roberts will not be entitled to participate in this second interim dividend.

Aspro and Griffiths Hughes

Griffiths Hughes Proprietaries Ltd. has received an offer from Aspro-Nicholas Ltd. to acquire the whole of the issued ordinary stock of the company for a consideration consisting of three Aspro-Nicholas Ltd. ordinary shares of 5s. each, credited as fully paid, and £6 cash for every £4 ordinary stock of Griffiths Hughes sold and purchased (*i.e.* three-quarters of one Aspro-Nicholas ordinary share of 5s. and 30s. cash for every £1 ordinary stock of Griffiths Hughes sold and purchased).

The offer is subject to acceptance by 90% of the ordinary stock of Griffiths Hughes or such lesser percentage as Aspro-Nicholas may decide.

If Aspro-Nicholas are successful in their bid the combined companies will be one of the biggest manufacturers of proprietary medicines in Britain.

Subsidiaries of Griffiths Hughes Proprietaries include E. Griffiths Hughes Ltd., J. C. and J. Field., D. R. Collins Ltd., Peter Claridge Ltd., Goya Ltd., Jane Seymour Ltd., and Peter Lunt and Co.

Aspro-Nicholas subsidiaries include Clinical Products Ltd., Ivers-Lee (Great Britain), Lifeguard Products, Medopharma Ltd., Persomnia Ltd., Victoria Laboratories, and Nicholas of India Ltd.

First-aid box contents change

Changes have been prescribed in the contents of first-aid boxes, cases and cupboards for workers at docks and on building sites: the new contents have already been prescribed for workers in factories.

This is the effect of two new orders—the Building Operations (First-aid Boxes) Order, 1959,* and the Docks (First-aid Boxes) Order, 1959†—made by the Minister of Labour.

Both new Orders require the inclusion in first-aid boxes of the leaflet giving advice on treatment, which has been revised in the light of progress made in such treatment in recent years. They also require that all materials shall be of a grade and quality not lower than the standard specified by the British Pharmaceutical Codex. Specifications for adhesive dressings for wounds, and for eye ointment, for which provision is made in the Orders, are given in certificates of approval of the Chief Inspector of Factories.

* S. I. 2080. † S. I. 2081.

Dangerous Drugs Act

The Dangerous Drugs Act, 1951 (Application) Order, 1959 which came into operation on January 1, includes some new drugs in the category of Dangerous Drugs, producing ill-effects of the same character or analogous to those produced by morphine or cocaine, namely:

Benzethidine (Ethyl 1(2-benzyloxyethyl) - 4 - phenylpiperidine - 4 - carboxylate), its salts and any preparation, admixture, extract or other substance containing any proportion of benzethidine;

Dimenoxadole (2 - dimethylaminoethyl - 2 - ethoxy - 2 : 2 - diphenylacetate), its salts and any preparation, admixture, extract or other substance containing any proportion of dimenoxadole;

Furethidine (Ethyl 1(2-tetrahydrofurfuryloxyethyl) - 4 - phenylpiperidine - 4 - carboxylate), its salts and any preparation, admixture, extract or other substance containing any proportion of furethidine;

Norcodeine, its salts and any preparation, admixture, extract or other substance containing any proportion of norcodeine;

Normorphine, its salts and any preparation, admixture, extract or other substance containing any proportion of normorphine;

Phenazocine (2¹ - hydroxy - 5 : 9 - dimethyl - 2 - (2 - phenylethyl) - 6 : 7 - benzomorphan), its salts and any preparation, admixture, extract or other substance containing any proportion of 2¹-hydroxy-5 : 9-dimethyl-2-(2-phenylethyl)-6 : 7-benzomorphan.

The Dangerous Drugs Act, 1951 (Relaxation) Order, 1959, which also came into operation on January 1, releases these same drugs from restrictions of trade and manufacture in the U.K. as specified in Subsection (1) of section eleven of the Dangerous Drugs Act, 1951.

Pharmaceutical conference papers

The annual meeting of the British Pharmaceutical Conference for 1960 will be held in Newcastle from September 5 to September 9 inclusive. The usual Science Sessions will be held for the presentation and discussion of papers dealing with original work on subjects of pharmaceutical interest. Contributions may take the form of:

(i) a complete paper, as concise as possible—4,000 words maximum; or

(ii) a short communication, 1,000 words maximum, or two pages of the *Journal of Pharmacy and Pharmacology* when complete with title, references tables and figures.

While the same standard will be applied to both types of paper in assessing their suitability for acceptance, the short communication may take the form of:

(i) A brief report in place of a full paper when time or other circumstances have not permitted a detailed full paper to be written up; or

(ii) A report of work of a somewhat less original character than is required for a full paper, but of a sufficiently high standard; or

(iii) A report complete in itself, but forming part of a research project so far unfinished.

It will not be possible to consider any manuscripts of either type of paper received after May 23.

Additional information may be obtained on application to: E. F. Hersant or D. Train, Honorary General Secretaries, 17 Bloomsbury Square, London, W.C. 1.

Determination of N

British Standard for Nitrogen combustion train (Micro-Dumas) (B.S. 1428: Part A2 : 1959). This newly-revised standard, which specifies the various components of a combustion train for the micro-determination of nitrogen, takes account of developments in technique since it was first published (1950), notably the replacement of the Hein-Kipp carbon dioxide generator by the Tucker generator.

Copies of this Standard may be obtained from the British Standards Institution, 2 Park Street, London, W.1. 4s. 6d. net.

Technical Press Review—February

World Crops.—Special Review of Agricultural Chemicals; Fertilisers in the Australian Wheat Industry; Worth-while Manuring; Liquid Nitrogen Fertilisers in the USSR; Agricultural Chemicals from Oil.

Automation Progress.—Weighing Equipment for the Process Industry; A New Figure Reading System; Instrumentation and Control of an Oil Refinery; A Computing Centre for Air Traffic Control; Industrial Applications of *p*H Control; Ultrasonic Flowmeters for Industrial Applications.

Petroleum. — Drilling Fluids; Effect of CMC Viscosity on Drilling Mud Properties; Bentonite in Drilling Muds; Conversion of Heat into Work —Some Thermodynamic Aspects; Oil Survey in English Channel; Corrosion Problems of the Petroleum Industry; X-ray Testing in Pipeline Welding.

Food Manufacture. — James Keiller and Sons, Dundee, Factory; Flavours and Flavouring Agents; Ice Cream; The Baking Industry.

Chemical and Process Engineering.—Distillation; Filtration; Ceramics and Cermets in Nuclear Engineering; Swedish Heavy Water Process.

Dairy Engineering. — Developments in Ice Cream Manufacture; Transport of Ice Cream; The Monitoring of Radioactive Contamination in Milk; Ice Cream Equipment; Practical Cleaning Routines for the Dairy—1; How Hire Purchase Can Help the Dairyman.

Fibres and Plastics.—Dyes and Pigments for Plastics and Fibres; Stabilisers for PVC; U.V. Absorbers for Synthetic Fibres and Plastics; Dyes and their Applications to Modern Requirements in Textile Colouring; High-frequency Welding Process for Plastic Book-covers.

Paint Manufacture.—Advanced Paint Chemistry—6, Polyester Resins; Rheology of Paint; Silicones Improve Wax Polishes—3; Segregated Pilchard Oils.

Corrosion Technology.—Underground Corrosion and its Prevention; Keeping Metals Clean; Calcium Plumbate Paints; Pure Water by Deionisation.

*For specimen copies and subscription forms apply to the Circulation Manager, Leonard Hill House, Eden Street, London, N.W.*1.

Change of name

From January 1, 1960, The Thames Sack and Bag Co. Ltd. will be known as The Thames Packaging Equipment Co.

NEW I.C.I. OFFICES PROVIDE 291 ROOMS

Brunner House, new offices of the Alkali Division, I.C.I., at Winnington, Cheshire, which were opened by Sir Alexander Fleck, I.C.I. chairman, in January. It is designed to house up to 750 *headquarters staff. Total floor area is* 165,000 *sq. ft., of which some* 30% *is taken up by lavatories, cloakrooms, plant room, etc. The remaining area provides* 291 *rooms ranging from single offices to offices for up to* 60 *people. The ventilation system handles* 5 *million cubic ft. of air per hr. The building stands in* 6 *acres, one of which will be devoted to trees and shrubs and* 5 *to grass.*

Drug exports hit £40m.

The British pharmaceutical industry's exports reached a record figure of over £40 million in 1959, an increase of £2·4 million over 1958. Exact figures were: 1959 — £40,094,669, 1958 — £37,646,225. Well over one-quarter of the industry's production is now being exported.

The best customers were Australia (3·98m.), Nigeria (£2·64m.), the Irish Republic (£1·97m.) and New Zealand (£1·87m.). Canada (£1·26m.) and the U.S.A. (£1·15m.) also show increases.

The largest specified group was antibiotics (£7·9m.), followed by vitamins (2·7m.). Exports of alkaloids, aspirin and sulphonamides each exceeded £1 million.

Figures for the main countries and product groups were:

EXPORT OF BRITISH DRUGS AND MEDICINES—1959

	£ million	
Main markets	*1958*	*1959*
Australia	3·32	**3·98**
Nigeria	2 10	**2·64**
Irish Republic	1·56	**1·97**
New Zealand	1·86	**1·87**
India	1·66	**1·43**
South Africa	1·83	**1·40**
Pakistan	1·53	**1·33**
Canada	0·96	**1·26**
Ghana	0·97	**1·17**
U.S.A.	1·08	**1·15**
Burma	0·85	**0.96**
Kenya	0·78	**0.83**
Main items		
Vitamins	2·51	**2·70**
Antibiotics	8·34	**7·90**
Alkaloids	1·33	**1·64**
Aspirin	1·14	**1·19**
Anti-histaminics	0·46	**0·54**
Synthetic anti-malarial drugs	0·82	**0·89**
Barbiturates	0·56	**0.58**
Ointments and liniments, not elsewhere specified	1·20	**1·34**
Insulin	0·50	**0·43**
Sulphonamide preparations	1·19	**1·05**
Proprietary medicines, not elsewhere specified	10·51	**11·67**

New instrument factory

Nash and Thompson Ltd. have acquired a seond factory at Hook Rise, Tolworth, within 200 yd. of their present research and production unit in Oakcroft Road, Chessington. This new factory has increased the available space by 35,000 sq. ft. and the transfer of administrative departments, research and development and some production departments has now been completed.

The purchase of this property was made necessary by the continued expansion of production and development during the last few years. More than 30 new instruments have been added to the range of standard instruments during the last two years.

Other activities include the manufacture of scintillator chemicals for the detection of radioactivity.

Phenol on trial

An agreement regarding phenol is due to be tried before the Restrictive Practices Court on February 15. This is one of 120 cases at various stages of preparation for trial. Last year 770 agreements out of 2,240 on the register came to an end.

A hundred years old

Thos. Christy and Co. Ltd. celebrate their centenary this year. Essentially a family business, they have maintained both their individuality and their family tradition throughout three generations and despite the changing conditions, wartime disasters and intensive competition of a turbulent and progressive era. Since 1860, when Thomas Christy founded the business in London as "Importers of New Drugs and Plants," his descendants have developed their private enterprise into a company widely associated with pharmaceutical products, toilet preparations and perfumery. The family motto—*sic viresco*—Thus I flourish—symbolises their success.

News from Abroad

KENYA

Industrial developments

Mr. W. Leonard Hill, now on a visit to Kenya, has met Mr. H. B. Stent, director of the East African Industrial Research Organisation in Nairobi and discussed local industries of chemical and pharmaceutical interest. The wattle industry, Mr. Hill learned, is in the doldrums. The only product is tanning extract and there does not seem to be any attempt to develop new products. Another industry which is having difficulties is the sisal by-products industry run by Amboni Estates. They are producing pectin and wax from sisal but find it difficult to market. On the other hand, Glaxo have a plant for extracting the cortisone starting material—hecogenin—from sisal. A valuable local cosmetic raw material is avocado oil from avocado pears.

Another familiar name in Kenya is the Wellcome Foundation. Burroughs Wellcome have for some years operated a laboratory there but recently the Foundation provided funds for the establishment of a laboratory at Kabete, near Nairobi for studying foot and mouth disease. This laboratory has been donated to the Government of Kenya and it is due to be officially opened on February 22 by Brig. Sir John Boyd, F.R.S., one of the Wellcome Trustees. He will also open the Wellcome Medical Library which is attached to the Government's Medical Unit.

SOUTH AFRICA

Shark bite discovery

Discoveries which would save the lives of swimmers have been made in the Durban aquarium. "The most dramatic discoveries have come from culturing and examining the germs from the teeth of living sharks which cause deadly sepsis after their bites," said the president of the Marine Biological Research Association at the annual meeting of members. A very virulent hæmolytic (blood destroying) staphylococus would appear to be the casual organism.

Take-over bid

African Products Manufacturing Co. Ltd., has disclosed that it is bidding for the share capital of Glucose and Starch Products Ltd., Bellville, near Cape Town.

Detergent plant planned

A Salisbury, Southern Rhodesia, soap company which is part of a world-wide organisation, is erecting a plant to produce non-soapy detergents, at an estimated cost of £250,000. Until this plant is in production the Federation will continue to depend on imported powdered detergents. The managing director of the company said that at the outset there would be no difference in price between the imported detergents and those made in the Federation, but it is the aim of the company to bring down the price as the volume of production rises. The installation will be large enough to meet a demand three times that at present existing for detergents in the Federation.

UNITED STATES

Folic acid danger

Medical News reports that a committee representing the three military medical services has called for removal of folic acid from multi-vitamin preparations. Reasons: folic acid masks the symptoms of pernicious anæmia until it may be too late to prevent "devastating" neurological complications.

Col. William H. Crosby, Jr., Walter Reed Army Institute of Research, suggested that "a couple of hundred patients a year" may suffer permanent CNS damage because of inadvertent folic acid therapy.

New Products

Anti-bacterial skin cleanser

Introduced by Bayer Products Ltd. in January is a new antibacterial skin cleanser, *pHisoHex*. It is a creamy emulsion containing a new detergent (alkylphenoxypolyethersulphonate), as well as 3% hexachlorophene on a weight for weight basis in a colloidal dispersion and lanolin cholesterols. It is claimed that because it has the same *p*H as skin and because of its emollient action, it does not cause the drying, irritating and allergic effects normally associated with soap and detergents and that the new detergent is 40% more surface active than soap and so cleans and degerms faster. Lathering is less than with soap but is unaffected by water hardness.

After washing with *pHisoHex* a semi-permanent anti-bacterial film is formed on the surface of the skin which continues the anti-bacterial action for many hours and sometimes days. Consequently frequent use produces a virtually sterile skin. Due to the presence of lanolin in the emulsion a very high concentration of water-insoluble hexachlorophene is transferred to the skin.

Its use is recommended throughout the hospital for the prevention of cross-infection. Similarly it may also be used by the general practitioner for between-patient washes.

A 150 ml. refillable squeeze container retails at 11s. + 1s. 10d. purchase tax. Trade and hospital: 7s. 4d.

A 4-litre polythene container (returnable container charged at 10s.) retails at 150s. + 25s. purchase tax. Trade and hospital: 100s.

Striped toothpaste

Signal, the new toothpaste launched by D. and W. Gibbs Ltd., is technically novel in two respects: it incorporates an antiseptic—hexachlorophene—and it emerges from the tube with five pink stripes so that it looks like a miniature stick of seaside rock. Hexachlorophene is intended as the mouthwash component of the toothpaste. Mouthwashes are seldom used in this country. Gibbs claim they are exploiting a desire to use mouthwash with the minimum fuss. The antiseptic is incorporated in the five pink stripes which are produced by means of a special nozzle with five tiny orifices around the periphery. The stripes extrude through these holes and lay on the surface of the paste. Prices are 2s. and 2s. 11d.

Introducing *Signal* at a press conference in London, the chairman of Gibbs, Mr. J. P. Mann, said that in the last ten years the incidence of dental decay among schoolchildren had doubled; 98% of children need dental treatment. Only 25% of adolescents clean their teeth night and morning; 39% only occasionally or not at all.

Amino acid for fluid retention disorders

After a long period of research, workers at the Bellevue Hospital, New York City, have found L-lysine monohydrochloride, a nutrient amino and salt, to be highly effective in restoring responsiveness to mercurial diuretics in patients suffering from severe cedema caused by congestive heart failure or cirrhosis of the liver.

The recommended daily dosage of 40 g. of L-lysine monohydrochloride in the treatment of these patients provides 200 milli-equivalents (m.eq.) of acid and chloride ion—equal to 11 g. of ammonium chloride, or 12 g. of calcium chloride. This dosage of L-lysine proved acceptable in flavour and was generally well tolerated by patients. In the production of hyperchloremic acidosis, 40 times as much L-lysine is used as in ordinary dietary supplementation with this essential nutrient.

Sulphaphenazole

Orisulf (sulphaphenazole), developed by Ciba Laboratories Ltd., is said to be particularly suitable for preventing upper respiratory tract infections because it can be taken daily for long periods without side effects. It is the prophylactic agent of choice for elderly chronic bronchitics. A small daily dose, or prompt treatment at the first signs of infection, provide protection during the winter months, when such patients are particularly vulnerable. *Orisulf* is also recommended for the treatment of infections such as tonsillitis, pneumonia, sinusitis, urinary tract infections, intestinal infections, otitis media, and febrile illnesses.

Orisulf is obtainable, exempt from Purchase Tax, at 5s. for 25 0·5 g. tablets.

Meetings

Institution of Plant Engineers

February 18. "Some Experiences with Chemical Engineering Plant," by J. C. Veale. 7.30 p.m. Castle Hotel, Blackburn.

Society of Chemical Industry

February 24. "New Methods of Factory Hygiene in the Food Industry—1. Chemical Sterilants in the Food Industry. 2. Hygienic Considerations in Food Plant Design," by G. A. Thomas and W. J. Blois-Johnson. 6.15 p.m. S.C.I., 14, Belgrave Square, London, S.W.1.

March 7. "Recent Advances in the Chemistry and Industrial Applications of Hydrido- and Organo-Boron Compounds," by W. Gerrard. 6.30 p.m. S.C.I., 14, Belgrave Square, London, S.W.1.

March 16. "High Temperature Reactions involving Condensed Phases," by F. D. Richardson. 6.30 p.m. University College, Gower Street, London, W.C.1.

March 8. "The Application of the Engineering Sciences in the Chemical Industry," by H. Fossett. 6 p.m. S.C.I., 14, Belgrave Square, London, S.W.1.

Fertiliser Society

February 25. "Modern Techniques in the Application of Fertilisers," by P. Hebblethwaite. 2.30 p.m. Lecture Hall of the Geological Society, Burlington House, Piccadilly, London, W.1.

Society of Cosmetic Chemists

March 15. "Fragrance in the Natural Orders," by E. S. Maurer. 7.30 p.m. Royal Society of Arts, John Adam Street, London, W.C.2.

Institution of Chemical Engineers

February 23. "Vibratory ball-mills," by H. E. Rose. 5.30 p.m. The Geological Society, Burlington House, London, W.1.

March 9. "Recent developments in heat transfer," by O. A. Saunders. 7 p.m. Lecture Theatre A, The Houldsworth School of Applied Science, University of Leeds, Leeds 2.

Royal Institute of Chemistry

March 3. "A Chemist's Thoughts on Chemotherapy," by H. J. Barber. 6.30-7.0 p.m. West Ham College of Technology, Romford Road, London, E.15

March 8. "Science in the Detection of Crime," by I. G. Holden. 7.0-7.30 p.m. Hatfield Technical College, Roe Green.

March 9. "Surface Chemistry," by K. G. A. Pankhurst. 6.30-7.0 p.m. Chelsea College of Science and Technology, Manresa Road, London, S.W.3.

March 16. "High Temperature Reactions involving Condensed Phases," by F. D Richardson. 6.0-6.30 p.m. University College, Gower Street, London, W.C.1.

Chemical Society

February 19. "Electron Resonance Studies of Unstable Radicals," by J. E. Ingram. 8.30 p.m. University Chemical Laboratory, Lensfield Road, Cambridge.

February 22. "Hydrocarbon-metal Carbonyls," by P. L. Pauson. 5 p.m. Science Laboratories, South Road, Durham.

February 25. "Chemotherapy," by F. L. Rose. 5 p.m. Dept. of Inorganic and Physical Chemistry, The University, Liverpool.

February 25. "Some Glimpses into the Variations which Nature brings about in Acetylenic Compounds," by N. A. Sørensen. 7.30 p.m. Large Chemistry Lecture Theatre, Imperial College, South Kensington, S.W.7.

February 25. "The Molecular Structure of Benzene," by D. H. Whiffen. 5 p.m. Edward Davies Chemical Laboratories, University College of Wales, Aberystwyth.

February 25. "Nuclear Magnetic Resonance," by R. E. Richards. 5.15 p.m. Department of Chemistry, The University, Bristol.

February 25. "Anthraquinone Chemistry," by S. Coffey. 5 p.m. Organic Lecture Theatre, Chemistry Dept., The University, Hull.

February 25. "Developments in the Study of Electrophilic Substitution," by Sir Christopher Ingold. 6.30 p.m. Chemistry Lecture Theatre, The University, Leeds.

February 26. "Alkali-metal Derivatives of Organic and Organometallic Compounds," by G. E. Coates. 8.30 p.m. University Chemical Laboratory, Lensfield Road, Cambridge.

February 26. "The Chemistry of Poisoning," by A. S. Curry. 5.15 p.m. Chemistry Dept., St. Salvator's College, St. Andrews.

February 29. "Rotational Isomerism (and Energy Barriers) in Organic Nitrites," by P. Gray. 5 p.m. University Chemical Laboratory, Lensfield Road, Cambridge.

February 29. "Chemical Engineering Aspects of Atomic Energy," by P. V. Danckwerts. 8.15 p.m. Inorganic Chemistry Laboratory, Oxford.

February 29. "Design in High Polymers," by C. E. H. Bawn. 5.15 p.m. Dept. of Chemistry, University College, Swansea.

March 3. "Death by Poisoning," by A. C. Hunt. 5 p.m. Edward Davies Chemical Laboratories, University College of Wales, Aberystwyth.

March 3. "Some Aspects of the Photographic Reproduction of Colour," by H. Baines. 6.30 p.m. Dept. of Chemistry, The University, Bristol.

March 3. "Recent Developments in the Chemistry of Some Less Common Elements," by R. S. Nyholm. 5 p.m. Room C6, Royal Technical College, Salford.

March 4. "Weak, Very Weak, and Extremely Weak Bonds," by L. J. Bellamy. 4.30 p.m. Large Chemistry Lecture Theatre, The University, Birmingham.

March 4. "The Biogenesis of Porphyrins," by A. Neuberger. 6 p.m. Chemistry Dept., King's College, Newcastle upon Tyne.

March 7. "Steric Effects of Hyaluronic Acid on the Distribution of Other Solutes," by A. G. Ogston. 5 p.m. University Chemical Laboratory, Lensfield Road, Cambridge.

March 7. "The Organic Chemistry of Metal Carbonyls," by M. C. Whiting. 5 p.m. Science Laboratories, South Road, Durham.

March 7. "Developments in the Chemistry of Bacterial Walls," by J. Baddiley. 5.30 p.m. Chemistry Dept., University College, Cathays Park, Cardiff.

March 8. "Developments in the Chemistry of Bacterial Walls," by J. Baddiley. 5.15 p.m. Dept. of Chemistry, University College, Swansea.

March 10. "The Structure of Yeast," by A. A. Eddy. 4 p.m. Large Lecture Theatre, Chemistry Dept., The University, Manchester.

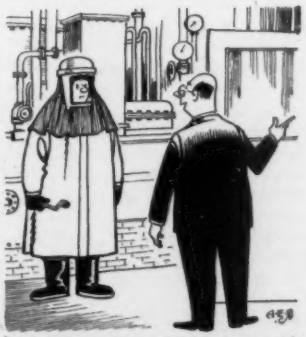
March 10. "Ionic Crystals and their Melts," by A. R. J. P. Ubbelohde. 7.30 p.m. Large Chemistry Lecture Theatre, Imperial College, South Kensington, S.W.7.

March 11. "Some Problems in Phosphonitrilic Chemistry," by N. Paddock. 5 p.m. Chemistry Dept., The University, Southampton.

March 14. "Optical Rotatory Dispersion in Structural Organic Chemistry," by W. Klyne. 5.15 p.m. Dept. of Chemistry, University College, Swansea.

March 16. "Progress in the Study of Heterogeneous Catalysis," by C. Kemball. 5.30 p.m. Chemistry Dept., King's College, Newcastle upon Tyne.

March 17. "X-ray Fluorescence Analysis," by J. R. Stansfield. 6.30 p.m. Dept. of Chemistry, The University, Bristol.



"AH, WILLIAMS, JUST THE MAN I WANT—THERE'S A SWARM OF BEES ON THE OFFICE WINDOW"

THE CHEMICAL MARKET

ZINC OXIDE DOWN BY 50s.; ETHYL ALCOHOL DEARER

LONDON.—There are no striking changes this month. There are the usual fluctuations in oils, fats, gums and waxes and in our fine chemicals list three reductions: **mercury iodide** down by 2s. 9d. lb., **silver nitrate** by ½d. oz., and **zinc oxide** by 50s. ton. **Ethyl alcohol** has gone up by 2d. gal. **Nickel sulphate** is up by 20s. ton. **Phthalates** (diethyl and dimethyl) are both down.

FINE CHEMICALS

Acetanilide 12½ kg. 7s. 4d. kg.
Arsenic trioxide
5 cwt. drums £38-40 ton
Ascorbic acid
100 kg. £4 14s. kg.
Aspirin
56 lb. 5s. 2d. lb.
1-cwt. 4s. 8d. „
5-cwt. lots 4s. 10d. „
Atropine
Sulphate, 500 g. £59 18s. 6d. kg.
Alkaloid, 500 g. £68 15s. kg.
Benzene B.P.C. 28-lb. lots 1s. 8d. lb.
Benzoic acid 12½ kg. 7s. 4d. kg.
Benzyl benzoate
According to pack 5s. to 7s. 2d. lb.
Bismuth oxide B.P.C. 1934
28-lb. lots 26s. 10d. lb.
Bismuth salts 28-lb. lots:
Carbonate 22s. 3d. lb.
Subgallate 21s. 1d. „
Salicylate 21s. 9d. „
Subnitrate 20s. 5d. „
Borax B.P.
Powder £60 10s. ton
Extra fine £61 10s. „
Boric acid B.P.
Crystal £99 „
Powder £96 10s. „
Bromine B.P.C. 7-lb. lots 6s. lb.
Caffeine 50 kg. 42s. 6d. kg.
Calamine 50 kg. 4s. kg.
Calcium gluconate
1 cwt. lots dlvd. 3s. 7d. lb.
Calcium glycerophosphate
50 kg. 28s. 6d. kg.
Calcium lactate B.P.
7-lb. lots 2s. 11d. lb.
1-cwt. lots 2s. 4d. „
Chloral hydrate 50 kg. 10s. kg.
Citric acid, B.P. Powder or granulated:
1-cwt. lots 198s. cwt.
5-cwt. lots 193s. „
Codeine
Alkaloid 100 g. £138 10s. kg.
Phosphate 100 g. £110 „
Cream of tartar
1-cwt. lots £12 5s. cwt.
5-cwt. lots £12 3s. „
Ephedrine
Hydrochloride 3 kg. £7 1s. 1d. kg.
Alkaloid 3 kg. £12 7s. „
Sulphate 3 kg. £7 1s. 1d. „
Eucalyptol
1-cwt. lots 11s. lb.
5-cwt. lots 10s. 6d. „
Ferri ammonium citrate B.P.
1-cwt. lots, scales 4s. 5½d. lb.
1-cwt. lots, granules 3s. 7½d. „
Ferrous gluconate
1-cwt. lots dlvd. 6s. 3d. lb.
Gallic acid B.P.C.
1-cwt. lots 10s. „
Gluconic acid technical 50%
Minimum 12-gal. drums
19s. gal., drums extra, returnable
Glucono delta lactone
1-ton lots dlvd. 5s. net lb.
Glycerophosphoric acid
24 litres 11s. 10d. litre
Glycine (amino acetic acid)
12½ kg. 18s. 10d. kg.
Hexyl resorcinol 10 kg. £7 10s. „
Hydroquinone 12½ kg. 23s. 10d. „
Iodides
Ethyl 4 kg. bottles 62s. 9d. kg.
Mercury, red B.P.C.
12½ kg. lots 58s. 6d. „
Potassium B.P.
12½ kg. lots 15s. 3d. „
Sodium B.P.
12½ kg. lots 22s. „
Iodine, Chilean crude,
99% min. in wooden casks 15s. kg.
Iodoform
12½ kg. and under 50 kg. 42s. 6d. kg.
Lactose 50 kg. 3s. 2d. kg.
Lithium salts 5-cwt. lots
Benzoate 10s. lb.
Carbonate B.P.C. 11s. 3d. „
Chloride (commercial) powder
11s. „
„ granular 10s. 9d. „
Hydroxide 9s. 9d. „
Citrate B.P.C. 9s. „
Sulphate 8s. 6d. „
Salicylate, 10 cwt., dlvd. 9s. 9d. „
Magnesium carbonate B.P.
Light cwt. lots dlvd. £129 ton
Magnesium trisilicate 28-lb. packs
28-lb. lots 4s. 3d. lb.
1-cwt. lots 3s. 10d. „
5-cwt. lots 3s. 7d. „
Bulk rates for larger quantities are from 3s. 1d. lb. in 1-ton lots
Manganese hypophosphite B.P.C.
7-lb. lots 13s. 11d. lb.
1-cwt. lots 12s. 11d. „
Mercuric chloride B.P.
50-kg. lump 48s. 6d. kg.
Methyl salicylate 1-cwt. lots 3s. 3d. lb.
Morphine
Alkaloid, 100 g. £138 18s. 4d. kg.
Nicotinamide 1 kg. £2 16s. 6d. kg.
Nicotinic acid
12½ kg. 33s. 9d. kg.
1 kg. 36s. „
Oleine, B.P. extra pale, 3/4 cwt. drums returnable carriage paid G.B.
£160 ton
Phenolphthalein 50 kg. 24s. 3d. kg.
Phosphoric acid B.P.
(s.g. 1·750) 10-carboy lots 1s. 4d. lb.
Potassium permanganate B.P.
1-cwt. lots dlvd. 1s. 11½d. lb.
Procaine hydrochloride (foreign)
2 kg. 59s. kg.
Quinine 1-oz. lots 4s. 4d. oz.
Riboflavin
100 g. 5½d. g.
10 g. 7d. „
Saccharin
500 g. £7 4s. for this quantity
Salicylic acid
B.P., dlvd. 3s. 2½d. to 5s. 6d. lb.
Silver nitrate
500 g. 5s. 1$\frac{13}{16}$d. oz.
Sodium benzoate B.P.
1 cwt. lots 2s. 9½d. lb.
1-ton lots 2s. 7½d. „
Sodium gluconate technical
3-cwt. lots dlvd. 3s. net lb.
Sodium salicylate
50 kg. 8s. 8d. kg.
12½ kg. 9s. „
Sodium thiosulphate
Crystals, photographic quality
1-ton lots 49s. cwt.
Stearic acid B.P.C. flake, carriage paid G.B. £154 ton
Strychnine 25 oz.
Alkaloid 8s. oz.
Hydrochloride 8s. „
Sulphate 7s. „
Sulphaguanidine
12½ kg. 33s. kg.
50 kg. 32s. „
Sulphanilamide
12½ kg. 16s. 6d. kg.
50 kg. 15s. 4d. „
Sulphathiazole 12½ kg. 39s. 9d. „
Tannic acid B.P. Levis
1-cwt. lots 10s. lb.
Tartaric acid, B.P.
Powder or granulated,
10 cwt. or more £15 cwt.
Terpineol B.P.
40-gal. drums 2s. 4½d. lb.
1-cwt. lots 2s. 7d. „
Theophylline B.P.
500 g. 27s. 6d. for this quantity
Thiamine hydrochloride
100 g. 4d. g.
1 kg. £11 15s. kg.
Thioglycollate
Ammonium 12s. 4d. to 16s. 4d. lb.
Calcium:
7-lb. lots 17s. 3d. „
5-cwt. lots 14s. 3d. „
α-Tocopherol 25-g. lots 11d. g.
Vanillin 23s. 6d. to 30s. 6d. lb.
Zinc oxide B.P.
2-ton lots dlvd. £120 ton

GENERAL CHEMICALS

Acetic acid 1-ton lots dlvd.
80% Technical £99 ton
80% Pure £105 „
Glacial B.P. £114 „
99-100% Glacial £111 „
98-100% Glacial £108 „

Acetic anhydride
1-ton lots dlvd. £128 ton
Acetone
5-gal. drums, free, non-returnable £128 ton
40 to 45-gal. drums, 10-ton lots £88 „
Alum, potassium granular crystals
50 kg. 1s. 2d. kg.
Aluminium hydroxide B.P.C. 34
28-lb. lots 2s. 4d. lb.
Aluminium stearate
(Precipitate) 1-ton lots £253 10s. ton
Ammonia
Persulphate £6 13s. 6d. cwt.
Phosphate: Mono- £106 ton
Di- £97 10s. „
Amyl acetate
B.S.S. 10 tons and over £251 ton
Technical £249 „
Amyl alcohol
Technical in 1-ton lots £256 ton
Arsenic White powdered ex store £42 ton
n-Butyl acetate
10-ton lots £173 ton
n-Butyl alcohol
10-ton lots £132 ton
Calcium chloride
Solid and Flake, dlvd. £17 ton
Calcium oxide (Lime)
Ex marble 28-lb. lots 3s. 10d. lb.
Caustic soda
Solid in drums, dlvd. £34 14s. 6d. ton
Flake £36 ton
Chloroform B.P. ½-ton lots 2s. 11½d. lb.
Chromic acid
Dlvd. U.K. (less 2½%) 2s. 0½d. to 2s. 0¾d. lb.
DDT 3s. 0½d. to 3s. 2d. lb.
2 : 4-Dichlorophenoxyacetic acid
99% pure, 1-cwt. bags £320 ton
Dimethyl sulphate 440 lb. drum lots 1s. 8d. lb.
Ether (Diethyl ether)
Tech. B.S.S. and Solvent B.P.
1-ton lots in drums 2s. lb.
Ethyl acetate 10-ton lots £131 ton
Ethyl alcohol
95% Gay Lussac 66·0 o.p.
over 300,000 proof gallons per year in tank wagons
4s. 0¾d. per proof gal.
Ferrous sulphate 50 kg. 1s. 4d. kg.
Formaldehyde
40% by volume dlvd. England
1-ton lots £37 15s. ton
Glycerin
1·2627 s.g. chem. pure, 5 tons and up, 5-cwt. drums £241 10s. ton
1·2627 s.g. technical grade, 5 tons and up, 5-cwt. drums £236 10s. ton
Hexamine
1-ton lots
Technical, bulk 1s. 7½d. lb.
B.P.C. 1s. 10½d. lb.
Hydrochloric acid
Commercial 18s. 6d. cwt.
Hydrogen peroxide
27·5% weight £119 ton
35% weight £143 „
Lactic acid (1-ton lots)
Pale tech. 44% by weight 1s. 3½d. lb.
Dark tech. 44% by weight 9½d. lb.
Magnesium chloride
Solid (ex wharf): 1-ton lots £18 10s. ton
Magnesium sulphate £15 ton
Mercurous chloride (calomel)
50 kg. 65s. kg.
Mercury sulphide, red
Ton lots and over 30s. 6d. lb.
Methylated spirits (Industrial)
Perfumery quality 500 gal. and upwards: gal.
61 o.p. 7s. 2½d.
74 o.p. 7s. 10d.
5 to 10 gal.:
61 o.p. 8s. 8d.
74 o.p. 9s. 3½d.
Methyl ethyl ketone
10 tons dlvd. in drums £143 ton
Methyl isobutyl carbinol
10 tons and up, in drums, dlvd. £163 ton
Methyl isobutyl ketone
10 to 50 tons, in drums, dlvd. £169 ton
Naphthalene
Crystal, dlvd., 4-ton lots, spot £66 ton
Ball and flake (ditto) £86 15s. „
Nickel sulphate
dlvd. ton lots £189 ton
Nitric acid 70% intermediate £36 ton
Pentachlorphenol
Flake, technical, 1-ton lots, dlvd. 2s. 2d. lb.
Phenol Crystals:
Under 1 ton dlvd. from 1s. 7d. lb.
10 tons and over dlvd. in returnable drums from 1s. 4½d. lb.
Phthalates
10-ton lots in drums
Diethyl (B.S.) £187 10s. ton
Dimethyl (B.S.) £179 ton
Potassium bromide
50 kg. 5s. 6d. kg.
12½ kg. 5s. 8d. „
Potassium carbonate
Calcined 96 to 98% (1-ton lots ex store) £75 10s. ton
Hydrated (1-ton lots) £74 10s. „
Potassium fluoride
28-lb. lots 5s. 1d. lb.
Potassium sodium tartrate
5-cwt. lots £10 cwt.
Soda ash
dlvd. in loaned jute bags £15 12s. 6d.
Sodium cyanide
96-98% £130 ton
Sodium hydroxide 28-lb. lots:
sticks (1-lb. bottles) 4s. 3d. lb.
pellets „ „ 3s. 9d. „
Sodium metal 28 lb. lots 3s. 8d. „
Sodium metasilicate
Dlvd. U.K. in ton lots £26 ton
Sodium phosphate
Dlvd. ton lots: Di-sodium, crystalline £40 10s. ton
Anhydrous £88 „
Tri-sodium, crystalline £39 „
Anhydrous £86 „
Sodium silicate
dlvd. in drums £14 on
Sodium sulphate Ex works:
(Glauber salt) £13 ton
(Salt cake) unground, full truck loads £8 16s. 6d. ton
Sodium sulphide
Broken, returnable drums, dlvd. ton lots £37 2s. 6d. ton
Flake, ditto £38 12s. 6d. „
Solid ditto £36 2s. 6d. „
Sodium sulphite
Commercial crystals 4-ton lots £28 10s. „
(Dlvd. London in 1-cwt. single non-returnable bags)
Sodium tripolyphosphate
1-ton lots £95 ton
Stannic chloride 28-lb. lots 8s. 11d. lb.
Stannous chloride 28-lb. lots 9s. 5d. lb.
Strontium carbonate
96-98% 28-lb. lots 3s. lb.
Sulphuric acid, ex-works, according to quality and quantity
B.O.V. 78% from 8s. to 10s. cwt.
C.O.V. 96% from 11s. to 14s. cwt.
Zinc chloride
28-lb. lots sticks 6s. 9d. lb.

OILS AND FATS

Palm kernel oil
Refined, deodorised, 2-ton lots, naked, ex-works £153 ton
Palm oil
Refined, deodorised, 2-ton lots, naked, ex-works £106 ton
Stearine
dlvd. free bags
Pristerene 64 flake £148 ton
Pristerene 62 flake £133 „
Pristerene 61 flake £113 „
A premium of £2 ton is charged for powder and £4 for block

GUMS AND WAXES

Agar Agar No. 1
Kobe strip 15s. lb.
Powder £1 „
Beeswax
Dar-es-Salaam spot (nominal) £26 cwt.
Sudan spot (duty paid) £24 10s. „
Bleached white (slab) £29 10s. „
Refined yellow (slab) £26 10s. „
Benzoin
Sumatra spot £26 10s. cwt.
Siam spot £2 7s. 6d. lb.
Candelilla Spot £23 cwt.
Carnauba
Prime, Spot £47 cwt.
Fatty grey £31 „
Gum arabic Lump £9 10s. cwt.
Karaya Powder, Spot 3s. 8d. lb.
Paraffin wax
1-ton lots, acc. to grade £105 to £130 ton
Peru balsam 13s. 6d. lb.
Shellac
No. 1 orange £13 10s. cwt.
No. 2 orange £12 „
Transparent white 4s. 3d. lb.
Pale dewaxed 6s. „
Tragacanth
No. 1 spot £134 cwt.
No. 2 spot £122 „
Pale leaf £51 „
Amber £38 „
Brown to Red £27 „

NEW COMPANIES

These particulars of new companies have been extracted from the daily register of Jordan and Sons Ltd., company registration agents, Chancery Lane, London, W.C.2.

W. H. Kemp (Cheadle) Ltd. 10.12.59. 59 High Street, Cheadle, Staffs. Chemists, etc. £2,000. Dir.: Dr. Ruth V. Robson and T. G. Robson.

Hamilton Johnston and Co. Ltd. 11.12.59. 11 New Court, Lincolns Inn, London, W.C.2. £10,000. Mnfrs. of and dlrs. in chemicals, etc. Dir.: W. Johnston.

Miller, Walters Ltd. 9.12.59. 46 Market Place, Reading. Chemists, etc. £100. Sub.: J. Milston, 150 Green Lane, Edgware.

Ibbotsons Chemists Ltd. 9.12.59. 2 Bridge Street, Castleford, Yorks. £6,000. Dir.: Geo. D. W. Ibbotson.

Deroid Ltd. 8.12.59. 12 Bath Street, Rugby. Distributors of pharmaceutical preparations, etc. £500. Perm. Dir.: P. W. Labraham.

Nix Chemist Ltd. 23.12.59. 111 High Street, Billericay, Essex. To take over bus. of a chemist cd. on at Billericay by A. Thomas, etc. £1,000. Dir.: L. G. W. Kersey.

Gerald Hughes (Chemists) Ltd. 23.12.59. 14 Cross Street, Reading. To take over bus. of chemists and druggists, etc. £2,000. Dir.: E. H. Waller.

J. T. Dunn and Co. Ltd. 23.12.59. 11 Lower Bridge Street, Chester. Drugstore propprs., etc. £4,000. Dir.: J. T. Dunn.

McHardy (Chemists) Ltd. 24.12.59. 203a East Lane, Wembley, Middx. £1,000. Dir.: J. D. T. Cleevely.

Hubert B. Figg (Chemists) Ltd. 28.12.59. 173 High Street, Berkhamsted, Herts. £10,000. Dir.: K. W. Sharland.

UNA Pharmaceuticals Ltd. 28.12.59. Neville House, Eden Street, Kingston-on-Thames. £100. Dir.: J. S. Gwatkin.

Berkeley Laboratories (Manchester) Ltd. 30.12.59. Morris House, 1/5 Jermyn Street, London, S.W.1. Mnfrs. of and dlrs. in cosmetics, lotions and toilet and beauty preparations and products, etc. £5,000. Dir.: Derek Barkaway.

E. B. Stamp Ltd. 31.12.59. To take over the bus. of a chemist and druggist cd. on at 29 High Street, London, N.W., by S. Barker as "E. B. Stamp," etc. £10,000. Dir.: Eric D. Miller.

NEW TRADE MARKS

APPLICATIONS

Cosmetics and toilet preparations

LOREAL.—785,218. *Société Monsavon-L'Oreal.*

FRANÇOIS d'ELIZABETH ARDEN.—786,814. *Elizabeth Arden Ltd.*

LANOSPRAY.—786,766. *Rosedale (Products) Ltd.*

HAVEN.—793,072. *Thomas Hedley and Co. Ltd.*

INFERNO.—793,156. *Merton Ian Behrman.*

PONDERMA. — 794,310. *Chesebrough-Pond's Ltd.*

SNOB.—794,621. *Le Galion.*

CAMAY.—795,125. *Thomas Hedley and Co. Ltd.*

Pharmaceuticals

PARENZYME.—777,163. *Vick International Ltd.*

"CHESTIES."—B782,428. *Teasdale and Co. Ltd.*

DR. SMITH'S.—B787,568. *Hall Brothers (Whitefield) Ltd.*

CARAMAC.—786,857. *John Mackintosh and Sons Ltd.*

BELOPAX.—786,980. *Multipax Chemicals Ltd.*

HAPHOS.—787,248. *Fearon Wilson and Co. Ltd.*

NESTLÉ.—B787,297. *The Nestlé Co. Ltd.*

STRESON.—788,593. *C. H. Boehringer Sohn.*

FARMISERINA.—789,967. *Societa Farmaceutici Italia.*

DARENTHIN.—791,441. *The Wellcome Foundation Ltd.*

NACTATE.—793,074. *Beecham Research Laboratories Ltd.*

PRINCILLIN.—793,227. *Beecham Research Laboratories Ltd.*

TUMENOL.—794,095. *Farbwerke Hoechst A.G.*

SOLUCOD.—794,662. *T. W. Stearne (Chemist) Ltd.*

New patents are from the *Journal of Patents*, and new trade marks are from the *Trade Marks Journal*. In each case permission to publish has been given by the controller of Her Majesty's Stationery Office. Each of the publications mentioned is obtainable from the Patent Office, 28 Southampton Buildings, London, W.C.2.

NEW PATENTS

COMPLETE SPECIFICATIONS ACCEPTED

Agricultural Chemicals

Herbicidal compositions. *Shell Research Ltd.* 828,871.

Fertilisers

Fertilisers. *J. C. Arnold (Facerform Co.)* 828,881.

Process for producing phosphatic fertiliser. *Lummus Co.* 828,892.

Process for producing phosphatic fertiliser. *Lummus Co.* 828,891.

Pharmaceuticals

Oxazolidinediones and process for preparation. *U.S. Vitamin Corporation.* 829,048.

Production of carboxylic acid esters. *Badische Anilin- & Soda-Fabrik A.G.* 828,876.

Medicine for reducing cholesterol level of the blood. *E. Lilly and Co.* 828,766.

Method of manufacturing the dioxide of thiourea. *Manufactures des Glaces et Produits Chimiques de Saint-Gobain, S.A. des Chauny & Cirey.* 828,907.

Process for the production of alpha alpha-spiro-heptamethylene-succinic acid amides. *Badische Anilin- & Soda-Fabrik A.G.* 828,753.

Bis-sulphonyl ureas and a process for their production. *Cilag Ltd.* 828,987.

Pharmaceutical preparations. *C. E. Frosst and Co.* 829,055.

Phosphatised hydroxy fatty acids or their esters, and emulsions and dispersions of the water-in-oil type. *Grindstedvaerket A.S.* 829,050.

Anæsthetic compositions comprising 2,2,2-trifluoroethyl vinyl ether and processes for producing same. *Air Reduction C. Inc.* 829,010.

Method of preparing 6-azauracil and its 5-alkyl-substituted derivatives. *Spofa, Spojene Farmaceuticke Zavody, Narodni Podnik.* 828,988.

Amino substituted triphenylethylenes and preparation thereof. *Sterling Drug Inc.* 828,762.

α-amino-β-hydroxycarboxylic acid amides and a process for their manufacture. *Farbwerke Hoechst A.G.* 828,694.

Sixty-Five Years Ago

From MANUFACTURING CHEMIST
February 1895

Antidotes for poisons

In cases where other articles to be used as antidotes are not in the house, give two tablespoonsful of made mustard in a pint of warm water. Also give large draughts of warm milk or water mixed with oil, butter or lard. If possible, give as follows: For bed-bug poison, corrosive sublimate, blue vitriol, lead water, saltpetre, sugar of lead, sulphate of zinc, red precipitate, vermilion. Give milk or white of eggs in large quantities. For Fowler's Solution, white precipitate, arsenic. Give prompt emetic of mustard and salt, tablespoonful of each; follow with sweet oil, butter or milk. For chloral hydrate, chloroform. Pour cold water over the head and face, with artificial respiration, galvanic battery.